



Welcome to your CDP Climate Change Questionnaire 2019

C0. Introduction

C0.1

(C0.1) Give a general description and introduction to your organization.

Headquartered in Allentown, Pa., PPL Corporation (NYSE: PPL) is a public utility holding company with more than \$7.8 billion in annual revenue and total assets of \$43 billion. The company’s seven operating utilities in the U.S. and U.K. employ more than 12,000 people, maintain approximately 218,000 miles of electric lines, and annually deliver more than 145 billion kilowatt-hours of electricity and 46.5 Mcf of natural gas.

PPL’s U.K. segment consists of regulated electricity distribution operations of Western Power Distribution plc (“WPD”), which serves 7.9 million customers in central and southwest England and south Wales.

PPL’s Kentucky segment consists primarily of the regulated electricity and natural gas operations of Louisville Gas and Electric Company (“LGE”) and Kentucky Utilities Company (“KU”), which serve nearly 1.3 million electric customers in Kentucky and Virginia, and 300,000 gas customers in Kentucky and operate 8,000 megawatts of regulated generating capacity.

PPL’s Pennsylvania segment consists of the regulated electricity transmission and distribution operations of PPL Electric Utilities Corporation (“PPL EU”), which serves approximately 1.4 million customers in eastern and central Pennsylvania.

In addition to these operating utilities, in 2018 PPL acquired Safari Energy (“Safari”), a leading provider of solar energy solutions for commercial customers in the United States. Safari is headquartered in New York.

C0.2

(C0.2) State the start and end date of the year for which you are reporting data.

	Start date	End date	Indicate if you are providing emissions data for past reporting years	Select the number of past reporting years you will be providing emissions data for
Row 1	January 1, 2018	December 31, 2018	Yes	3 years

C0.3

(C0.3) Select the countries/regions for which you will be supplying data.

United Kingdom of Great Britain and Northern Ireland

United States of America

C0.4

(C0.4) Select the currency used for all financial information disclosed throughout your response.

USD

C0.5

(C0.5) Select the option that describes the reporting boundary for which climate-related impacts on your business are being reported. Note that this option should align with your consolidation approach to your Scope 1 and Scope 2 greenhouse gas inventory.

Equity share

C-EU0.7

(C-EU0.7) Which part of the electric utilities value chain does your organization operate in? Select all that apply.

Row 1

Electric utilities value chain

Electricity generation

Transmission

Distribution

Other divisions

Gas storage, transmission and distribution

Smart grids / demand response

Battery storage

C1. Governance

C1.1

(C1.1) Is there board-level oversight of climate-related issues within your organization?

Yes

C1.1a

(C1.1a) Identify the position(s) (do not include any names) of the individual(s) on the board with responsibility for climate-related issues.

Position of individual(s)	Please explain
Board-level committee	The board's Compensation, Governance and Nominating Committee has regularly scheduled meetings at which sustainability strategy is discussed and climate-related issues are regularly incorporated into those discussions. The full board is also updated as important matters arise.
Board-level committee	The board's Audit Committee assists the board in its oversight of the identification and management of certain broad-based enterprise risks. The Audit Committee periodically reviews the company's enterprise risk management program, including its processes for identifying, assessing and managing business risks and exposures (including sustainability and climate-related issues), as well as formulating related guidelines and policies.

C1.1b

(C1.1b) Provide further details on the board's oversight of climate-related issues.

Frequency with which climate-related issues are a scheduled agenda item	Governance mechanisms into which climate-related issues are integrated	Please explain
Scheduled – some meetings	<ul style="list-style-type: none"> Reviewing and guiding strategy Reviewing and guiding risk management policies Reviewing and guiding business plans Overseeing major capital expenditures, acquisitions and divestitures Monitoring and overseeing progress against goals and targets for addressing climate-related issues 	<p>The board's Compensation, Governance and Nominating Committee ("CGNC") oversees the Company's practices and positions to further its corporate citizenship, including sustainability, environmental and corporate social responsibility initiatives. The CGNC has regularly scheduled meetings during which sustainability strategy is discussed and climate-related issues are regularly incorporated into those discussions.</p> <p>The board's Audit Committee receives quarterly reports on enterprise risk management. The Audit Committee regularly reviews risk management activities related to the company's financial statements and disclosures, certain legal and compliance matters, transition of the utility sector, and other key areas including but not limited to sustainability and climate-related issues.</p> <p>The full board is also updated as important matters</p>

		arise and receives reports from the Audit Committee and CGNC.
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C1.2

(C1.2) Provide the highest management-level position(s) or committee(s) with responsibility for climate-related issues.

Name of the position(s) and/or committee(s)	Responsibility	Frequency of reporting to the board on climate-related issues
Sustainability committee	Other, please specify Oversees assessment of climate-related issues	Not reported to the board
Other, please specify Vice President-Public Affairs and Sustainability	Other, please specify Assessing and overseeing climate-related issues	Half-yearly
Other, please specify Operating Company Leadership	Both assessing and managing climate-related risks and opportunities	As important matters arise
Chief Executive Officer (CEO)	Other, please specify Oversight of climate-related issues	As important matters arise
Chief Financial Officer (CFO)	Other, please specify Oversight of Enterprise Risk Management process	As important matters arise
Other, please specify Expanded Corporate Leadership Council	Other, please specify Reviews assessment and management of climate-related issues	Not reported to the board
Other, please specify Chief Operating Officer (COO) as of 2019	Other, please specify Oversight of climate-related issues	As important matters arise

C1.2a

(C1.2a) Describe where in the organizational structure this/these position(s) and/or committees lie, what their associated responsibilities are, and how climate-related issues are monitored (do not include the names of individuals).

Climate-related issues are incorporated into PPL's overall enterprise risk management (ERM) and business strategy processes. Operating Company leadership has primary accountability for identifying, assessing and managing climate-related risks and opportunities. Each operating company has a representative involved in the enterprise risk management process which provides a business portfolio view of material risks that may impact achievement of PPL's business strategy. The ERM process is overseen by the Chief Financial Officer.

The Corporate Sustainability Committee, which includes senior leaders throughout the corporation (including operating companies, human resources, compliance, risk, investor relations and audit), is responsible for developing sustainability strategy, providing oversight and establishing the priorities and performance metrics. The committee is chaired by the Vice President-Public Affairs and Sustainability. The sustainability strategy, commitments and priorities are reviewed by the expanded corporate leadership council (which includes PPL's CEO, CFO, CHRO, chief legal officer and operating company presidents - and starting in 2019, the newly created COO position) and presented to the Board of Directors, with specific oversight by the Compensation, Governance and Nominating Committee of the board.

C1.3

(C1.3) Do you provide incentives for the management of climate-related issues, including the attainment of targets?

Yes

C1.3a

(C1.3a) Provide further details on the incentives provided for the management of climate-related issues (do not include the names of individuals).

Who is entitled to benefit from these incentives?

Other, please specify
Designated employees

Types of incentives

Monetary reward

Activity incentivized

Other, please specify
Management of climate-related risks and opportunities

Comment

Incentive compensation includes individual goals for certain individuals responsible for management of climate-related issues. Additionally, base-pay increases are often based on annual employee performance, including management of climate-related issues for those with responsibility for those issues.

Who is entitled to benefit from these incentives?

Other, please specify
All LGE and KU employees

Types of incentives

Monetary reward

Activity incentivized

Behavior change related indicator

Comment

Reimbursement for employees who take mass transit to work.

C2. Risks and opportunities

C2.1

(C2.1) Describe what your organization considers to be short-, medium- and long-term horizons.

	From (years)	To (years)	Comment
Short-term	0	2	
Medium-term	3	5	
Long-term	6	15	

C2.2

(C2.2) Select the option that best describes how your organization's processes for identifying, assessing, and managing climate-related issues are integrated into your overall risk management.

Integrated into multi-disciplinary company-wide risk identification, assessment, and management processes

C2.2a

(C2.2a) Select the options that best describe your organization's frequency and time horizon for identifying and assessing climate-related risks.

	Frequency of monitoring	How far into the future are risks considered?	Comment
Row 1	Six-monthly or more frequently	3 to 6 years	Risks across the enterprise are reviewed and reported quarterly to senior management through the ERM process and are reviewed quarterly in the ERM Committee, at least annually by the Sustainability Committee and on an ongoing basis by the operating companies.

C2.2b

(C2.2b) Provide further details on your organization's process(es) for identifying and assessing climate-related risks.

Climate-related risks are identified and assessed at multiple levels in the Company. In 2017 PPL conducted a comprehensive and detailed enterprise-wide assessment of future requirements and technological advances aimed at limiting global warming to 2 degrees Celsius over pre-industrial levels. We expect to update this assessment every few years. In addition, multi-disciplinary assessments are conducted by each operating company and the results are communicated to PPL’s Enterprise Risk Management Group and the Corporate Sustainability Committee. Through the ERM process, risks are assessed and reported on a quarterly basis to corporate leadership on all important risks across the enterprise. The ERM process is chaired by the Senior Director - Risk Management. The Sustainability Committee engages on sustainability strategy and advises corporate leadership on sustainability matters. The Sustainability Committee is chaired by the Vice President-Public Affairs and Sustainability.

Strategy groups across our company evaluate different options to inform business strategy, using modeling and input from our internal experts and third parties as needed. Ultimately, these assessments inform our business strategy at the enterprise level as well as the operating company level. For example, our Kentucky operations incorporate these assessments into their integrated resources planning process. An Integrated Resource Plan is filed with the Kentucky Public Service Commission approximately every three years. At the enterprise level, these assessments are reviewed with senior management and our board on an ongoing basis. Our board’s Compensation, Governance and Nominating Committee (CGNC) was designated by the board with oversight over PPL’s practices and positions to further its corporate citizenship, including sustainability, environmental and corporate social responsibility initiatives. The CGNC has regularly scheduled meetings at which sustainability strategy is discussed, and climate-related issues are regularly incorporated into those discussions. The full board is also updated on an annual basis and more frequently as needed.

C2.2c

(C2.2c) Which of the following risk types are considered in your organization's climate-related risk assessments?

	Relevance & inclusion	Please explain
Current regulation	Relevant, always included	As power companies are heavily regulated, PPL’s enterprise risk management process, as well as compliance risk management processes, consider the risks and impacts of a wide variety of state and national regulations, many of which are climate-related and can have material impact (both as risks as well as opportunities) to the company.
Emerging regulation	Relevant, always included	PPL operates in a dynamic regulatory environment in all of its geographic locations and pays close attention to evolving and emerging regulations, including proposed carbon cap-and-trade, as well as additional renewable and energy efficiency requirements in Pennsylvania, EPA regulation of GHGs, and changes to emission allowance requirements in the UK.

Technology	Relevant, always included	PPL’s enterprise risk management process includes careful analysis of emerging technologies that can transform the industry, presenting significant risks as well as opportunities. These include energy storage, electric vehicles, renewable energy and smart grids.
Legal	Relevant, always included	Legal challenges, particularly to new regulations in the United States, can result in significant changes in risk and must always be taken into account in the company’s multi-disciplinary risk assessments.
Market	Relevant, always included	Demand for power is influenced by economic conditions, consumer preferences and weather.
Reputation	Relevant, always included	PPL’s customers, investors and other stakeholders are increasingly interested in PPL’s carbon footprint. PPL’s risk assessments are factoring this into long-term investment decisions.
Acute physical	Relevant, always included	Increasingly frequent severe weather is presenting physical risks to PPL’s system, presenting risks to reliability that must be regularly taken into account.
Chronic physical	Relevant, always included	Long-term temperature changes can affect PPL’s facilities and operations as well as demand for electricity. PPL considers this in its operational and strategic planning.
Upstream	Relevant, always included	Changes in laws or regulations that can affect our suppliers (particularly fuel, technology or building materials) can pose significant risks to our operations and are regularly considered by our operating companies in developing business plans.
Downstream	Relevant, always included	Customer preferences, particularly with respect to electric vehicles and renewable energy, are becoming increasingly important, posing both a risk and opportunity for the company.

C2.2d

(C2.2d) Describe your process(es) for managing climate-related risks and opportunities.

Climate-related risks and opportunities are primarily managed at the operating company level with oversight from the Corporate Leadership Council (CLC) which includes the CEO, CFO and General Counsel. Starting in 2019, a COO position was created and added to the CLC.

C2.3

(C2.3) Have you identified any inherent climate-related risks with the potential to have a substantive financial or strategic impact on your business?

Yes

C2.3a

(C2.3a) Provide details of risks identified with the potential to have a substantive financial or strategic impact on your business.

Identifier

Risk 1

Where in the value chain does the risk driver occur?

Direct operations

Risk type

Transition risk

Primary climate-related risk driver

Policy and legal: Increased pricing of GHG emissions

Type of financial impact

Increased operating costs (e.g., higher compliance costs, increased insurance premiums)

Company- specific description

Regulations that impose a cost of GHGs either through a cap-and-trade program or a carbon tax would result in additional operational costs to our operations in Pennsylvania, Kentucky and/or the U.K., with the greatest potential impact to our Kentucky operations.

Time horizon

Long-term

Likelihood

Likely

Magnitude of impact

Low

Are you able to provide a potential financial impact figure?

Yes, an estimated range

Potential financial impact figure (currency)

Potential financial impact figure – minimum (currency)

502,819,285

Potential financial impact figure – maximum (currency)

769,017,730

Explanation of financial impact figure

Financial impact calculated using PPL's 2018 domestic Scope 1 emissions and the carbon price included in LGE and KU's Integrated Resource Plan of \$17 - \$26 per ton. This is very conservative as the bulk of the emissions are in Kentucky and our plan does not project a carbon price in Kentucky prior to 2026.

Management method

This risk is managed across PPL Corporation's utility operations through seeking cost recovery in the jurisdictions we serve.

For our Kentucky operations, this risk is also managed through the integrated resources planning process, as well as through engagement with policymakers at the state and federal levels.

In the U.K., WPD has been purchasing carbon reduction credits under the U.K. Carbon Reduction Credit energy efficiency scheme to offset its building gas use and building electricity use. Going forward, WPD will be paying a carbon tax, the costs of which will be included in rates.

In Pennsylvania, discussions regarding a carbon regulation are beginning. PPL EU is closely following developments and will actively engage in lobbying on the issue as it develops.

Cost of management

145,390

Comment

The time horizon for this risk is based on Kentucky's regulatory environment as the greatest financial impact would be in Kentucky. Financial impact is actually impact on customers as all costs are included in utility rates. Cost of management has been limited to cost of Carbon Reduction Credits in the U.K. for 2017 - 2018.

Identifier

Risk 2

Where in the value chain does the risk driver occur?

Direct operations

Risk type

Transition risk

Primary climate-related risk driver

Policy and legal: Mandates on and regulation of existing products and services

Type of financial impact

Other, please specify

Revenue reduction due to reduced demand for our products and services in conjunction with rate design that is geared towards overall volume of use.

Company- specific description

Carbon regulation, if implemented, and depending upon specific requirements could reduce demand for electricity in various ways. Those ways include the following: increasing cost to customers, depressing regional economies, furthering energy efficiency or encouraging distributed generation, the impact of which could be exacerbated by net metering requirements. In the long term, this could significantly reduce revenues for PPL, reduce the need for PPL's centralized generation and electricity delivery, and make it more difficult for PPL to obtain just and reasonable rates, limiting our ability to earn an acceptable return on capital investments or fully recover operation and maintenance costs, particularly in the United States.

Time horizon

Long-term

Likelihood

Unlikely

Magnitude of impact

High

Are you able to provide a potential financial impact figure?

No, we do not have this figure

Potential financial impact figure (currency)

Potential financial impact figure – minimum (currency)

Potential financial impact figure – maximum (currency)

Explanation of financial impact figure

The financial impact of this risk is too speculative to estimate at this time. This risk could have a high impact due to the broad fundamental changes to our business model that could be driven by this risk.

Management method

This risk is managed by each operating company through advocacy and engagement with policymakers and regulators with an eye toward reasonable regulations and affordable rates. In addition, all operating companies are engaged in economic development programs in the regions that they serve, expanding customer offerings (such as renewable energy offerings) and providing customer assistance programs to help customers pay their bills.

In addition, PPL EU has successfully advocated for alternative rate design, and LGE and KU would address this risk through its rate case process. The risk for LGE and KU is also mitigated by provisions in Kentucky law under which net metering cuts off at 1% of the supplier's peak load, and the Kentucky Public Service Commission can set net

metering rates based on just and reasonable standards.

Cost of management

Comment

Cost of management not determined.

Identifier

Risk 3

Where in the value chain does the risk driver occur?

Customer

Risk type

Transition risk

Primary climate-related risk driver

Reputation: Shifts in consumer preferences

Type of financial impact

Reduced revenue from decreased demand for goods/services

Company- specific description

Growing public concern over climate change is driving increasing interest in clean energy. Our Kentucky operation's coal-fired plants could drive some Kentucky customers to develop off-grid solutions to support their operations. Attracting new customers and investments may also become increasingly difficult. Our ability to transition to low-carbon generation can be constrained in the current regulatory climate.

Time horizon

Long-term

Likelihood

More likely than not

Magnitude of impact

Low

Are you able to provide a potential financial impact figure?

No, we do not have this figure

Potential financial impact figure (currency)

Potential financial impact figure – minimum (currency)

Potential financial impact figure – maximum (currency)

Explanation of financial impact figure

The financial impact of this risk is too speculative to estimate at this time. The magnitude of impact reflects mitigation measures underway.

Management method

Our Kentucky operations are taking a variety of measures to provide clean energy options. LGE and KU have Kentucky's largest universal solar facility at 10 MW, two hydroelectric facilities (33 MW and 101 MW) and several thousand MW of natural gas turbines. LGE and KU have begun construction of a community solar site and have implemented a green tariff option for its customers to procure energy from renewable sources and receive credits on their monthly bills. LGE and KU have also created a new Energy Storage Research and Demonstration Site to continue developing large-scale battery storage technologies. LGE and KU in 2019 issued a request for proposal to energy suppliers for renewable energy. Overall, PPL is increasing its non-carbon-based assets, has adopted a carbon reduction goal and is economically retiring coal-fired generation, including LGE and KU's closure of more than 900 MW of coal-fired generation within the past five years.

Cost of management**Comment**

The total management cost has not been determined.

LGE and KU retain their monopoly status for all operations including generation and all LGE and KU's management costs are fully recoverable in rates.

Identifier

Risk 4

Where in the value chain does the risk driver occur?

Direct operations

Risk type

Transition risk

Primary climate-related risk driver

Technology: Costs to transition to lower emissions technology

Type of financial impact

Capital investments in technology development

Company- specific description

Increases in distributed energy resources and private renewable energy could pose a reliability challenge to delivery networks if not incorporated and managed appropriately. Such an increase could make it more difficult to monitor and adequately provide necessary 24/7 generation and to manage volatility in demand for power.

Time horizon

Current

Likelihood

Virtually certain

Magnitude of impact

Low

Are you able to provide a potential financial impact figure?

No, we do not have this figure

Potential financial impact figure (currency)

Potential financial impact figure – minimum (currency)

Potential financial impact figure – maximum (currency)

Explanation of financial impact figure

This is a reputational risk without a direct financial impact. The magnitude of impact reflects mitigation measures underway.

Management method

PPL’s utilities conduct planning studies based on sensitivity analyses looking at impacts to the system from renewables and distributed generation under various scenarios including peak load, minimum load and regional load. These studies inform decisions on cost-effective grid enhancements, including smart meters, to modernize and strengthen the grid.

In Pennsylvania, PPL EU is also engaged in the Keystone Solar project to understand how to best control distributed generation on the system. PPL EU also successfully supported legislation on alternative rates which would enable greater flexibility in making investments towards a stronger and more reliable grid.

WPD is transitioning from a Distribution Network Operator to a Distribution System Operator in order to more proactively support increased customer adoption of low-carbon technologies.

Cost of management

2,800,000,000

Comment

To address this risk as well as Risk #5, PPL is planning to invest approximately \$15 billion from 2019 through 2023 to modernize and strengthen its grid in the U.K., Kentucky and Pennsylvania.

Identifier

Risk 5

Where in the value chain does the risk driver occur?

Direct operations

Risk type

Physical risk

Primary climate-related risk driver

Chronic: Changes in precipitation patterns and extreme variability in weather patterns

Type of financial impact

Reduced revenues from lower sales/output

Company- specific description

The increasing frequency of severe storms can disrupt PPL's operations, increase costs and hurt the reliability of PPL's service in a variety of ways, including outages due to fallen trees and debris which can bring down power lines and block access for restoration efforts.

Time horizon

Current

Likelihood

Virtually certain

Magnitude of impact

Low

Are you able to provide a potential financial impact figure?

No, we do not have this figure

Potential financial impact figure (currency)

Potential financial impact figure – minimum (currency)

Potential financial impact figure – maximum (currency)

Explanation of financial impact figure

This is a reputational risk without a direct financial impact. The magnitude of impact reflects mitigation measures underway.

Management method

All of PPL's operating companies monitor their reliability performance and conduct planning analyses of their systems, looking at trends in weather, vegetation management and other impacts to system reliability. Based on these analyses, PPL is planning to invest approximately \$15 billion from 2019 through 2023 in infrastructure investments to modernize and strengthen its grid. This investment is to address Risk #4 as well as Risk #5

Cost of management

2,800,000,000

Comment

To address this risk as well as Risk #4, PPL is planning to invest approximately \$15 billion from 2019 through 2023, the bulk of which is for infrastructure improvements to modernize and strengthen the grid.

Identifier

Risk 6

Where in the value chain does the risk driver occur?

Direct operations

Risk type

Physical risk

Primary climate-related risk driver

Acute: Increased severity of extreme weather events such as cyclones and floods

Type of financial impact

Increased operating costs (e.g., inadequate water supply for hydroelectric plants or to cool nuclear and fossil fuel plants)

Company- specific description

Increasing frequency of severe storms can cause increased flooding that can damage electrical equipment or disrupt fuel supply, causing power outages or forcing PPL's utilities to purchase power from others in order to maintain reliability.

Time horizon

Current

Likelihood

Virtually certain

Magnitude of impact

Low

Are you able to provide a potential financial impact figure?

No, we do not have this figure

Potential financial impact figure (currency)

Potential financial impact figure – minimum (currency)

Potential financial impact figure – maximum (currency)

Explanation of financial impact figure

This is a reputational risk without a direct financial impact. The magnitude of impact reflects mitigation

Management method

LGE and KU maintain 20 to 45 days of coal inventory at their plant sites and have two sites that can receive coal by rail. The companies also have a diverse fleet of gas-fired generation assets that would not be impacted by high water conditions on the Ohio River.

WPD has established a goal to apply flood defenses to 75 substations. To date flood defenses have been installed at 27 substations. WPD has also conducted site surveys and data analyses at an additional 97 substations.

Cost of management

1,340,000,000

Comment

The stated management costs are calculated at 1 billion pounds per year for WPD's climate adaptation program for flood defense at its substations. The costs are included in WPD's rates.

Identifier

Risk 7

Where in the value chain does the risk driver occur?

Supply chain

Risk type

Transition risk

Primary climate-related risk driver

Policy and legal: Mandates on and regulation of existing products and services

Type of financial impact

Increased operating costs (e.g., higher compliance costs, increased insurance premiums)

Company- specific description

Pennsylvania continually considers increases to requirements under its renewable portfolio standards, which increases costs to customers. Of particular note is proposed legislation currently circulating within the Pennsylvania General Assembly which would require electric utilities to purchase as much as 50 percent of customer demand from nuclear energy as part of a new mandate under Pennsylvania's Alternative Energy Portfolio Standards Act (AEPS). This proposal, if adopted, will raise the average price of electricity for customers and depress regional economies. In the long term, this could make it more difficult for PPL to obtain just and reasonable rates, limiting our ability to earn an acceptable return on capital investments or fully recover operation and maintenance costs.

Time horizon

Current

Likelihood

About as likely as not

Magnitude of impact

Medium-low

Are you able to provide a potential financial impact figure?

Yes, a single figure estimate

Potential financial impact figure (currency)

140,000,000

Potential financial impact figure – minimum (currency)**Potential financial impact figure – maximum (currency)****Explanation of financial impact figure**

Based on price of obtaining Tier 1 credits in the current AEPS program in Pennsylvania to satisfy the proposed nuclear bailout legislation. The \$140 million impact would be to PPL's customers rather than directly to PPL. The impact on PPL is on its longer-term ability to obtain just and reasonable rates. The magnitude of impact is medium-low as it impacts one operating company only.

Management method

PPL EU is actively engaged in lobbying on this issue and communicating with customers and other stakeholders.

Cost of management

0

Comment

The stated management cost is the cost of lobbying on this issue. There would also be other administrative costs which are expected to be low. Lobbying costs are being incurred in 2019.

Identifier

Risk 8

Where in the value chain does the risk driver occur?

Investment chain

Risk type

Transition risk

Primary climate-related risk driver

Policy and legal: Other

Type of financial impact

Other, please specify

Lost opportunity to invest in power generation

Company- specific description

Legislative limitations on electric distribution companies in Pennsylvania and license limitations on distribution network operators in the U.K. currently prohibit PPL EU and WPD, respectively, from owning solar, wind and other generation resources to serve customers. This may continue to limit the extent of activities those companies may engage in to support the transition to a cleaner energy future.

Time horizon

Current

Likelihood

Virtually certain

Magnitude of impact

Low

Are you able to provide a potential financial impact figure?

No, we do not have this figure

Potential financial impact figure (currency)

Potential financial impact figure – minimum (currency)

Potential financial impact figure – maximum (currency)

Explanation of financial impact figure

Not quantified; cost is not direct but rather a lost opportunity cost related to utility-owned generation in the transition to a cleaner energy future.

Management method

Despite the inability of PPL's utilities to own generation resources in Pennsylvania and U.K., PPL's utilities have made significant investments in smart grid technology and the reliability of our delivery networks to adjust to changing customer preferences and enhance the integration of distributed energy resources (DER). The transition to a cleaner energy future and increased deployment of DER offers the U.K. and Pennsylvania companies the potential to take on an expanded role in actively managing distribution networks through both network and non-network solutions, products and services.

Cost of management**Comment**

This is more an opportunity cost than a risk

Identifier

Risk 9

Where in the value chain does the risk driver occur?

Direct operations

Risk type

Transition risk

Primary climate-related risk driver

Market: Other

Type of financial impact

Other, please specify

Competition from non-traditional electricity providers

Company- specific description

New participants from the technology, automotive and gas/oil industries are entering the utility market with alternative solutions to grid flexibility, energy use and demand for clean energy alternatives.

Time horizon

Long-term

Likelihood

About as likely as not

Magnitude of impact

Medium-high

Are you able to provide a potential financial impact figure?

No, we do not have this figure

Potential financial impact figure (currency)

Potential financial impact figure – minimum (currency)

Potential financial impact figure – maximum (currency)

Explanation of financial impact figure

The financial impact of this risk is too speculative to estimate at this time. The magnitude of impact reflects the potential broad impact to PPL’s investment opportunities.

Management method

PPL continues to monitor developments through industry associations and is engaged in R&D across the enterprise to increase customer offerings, programs and flexibilities.

Cost of management

Comment

This long-term risk has not yet been impactful to our business and therefore, management costs have not yet been quantified.

C2.4

(C2.4) Have you identified any climate-related opportunities with the potential to have a substantive financial or strategic impact on your business?

Yes

C2.4a

(C2.4a) Provide details of opportunities identified with the potential to have a substantive financial or strategic impact on your business.

Identifier

Opp1

Where in the value chain does the opportunity occur?

Direct operations

Opportunity type

Products and services

Primary climate-related opportunity driver

Other

Type of financial impact

Other, please specify

Investments in grid assets

Company-specific description

Increasingly frequent severe storm events can disrupt PPL's transmission and delivery operations, giving rise to the opportunity for PPL to invest in a stronger and more resilient and flexible network with more storm-resistant materials, increased redundancies and automated systems to minimize outage time.

Time horizon

Current

Likelihood

Virtually certain

Magnitude of impact

Medium-high

Are you able to provide a potential financial impact figure?

No, we do not have this figure

Potential financial impact figure (currency)

Potential financial impact figure – minimum (currency)

Potential financial impact figure – maximum (currency)

Explanation of financial impact figure

The magnitude of financial impact reflects the return expected on investments needed to enhance and modernize the grid, including transmission and distribution enhancements from 2019 - 2023. This covers both Opportunity 1 and Opportunity 2.

Strategy to realize opportunity

All of PPL's operating companies monitor their reliability performance and conduct planning analyses of their systems, looking at trends in weather, vegetation management and other impacts to system reliability. Based on these analyses, PPL is planning to invest approximately \$15 billion from 2019 through 2023 in infrastructure improvements, including replacing wood poles with steel.

Cost to realize opportunity

2,800,000,000

Comment

Opportunity to earn a return on investments in modernizing and strengthening the grid in all of PPL's operating areas.

PPL is planning to invest approximately \$15 billion from 2019 through 2023 in infrastructure improvements to modernize and strengthen its grid in the U.K., Kentucky

and Pennsylvania.

Identifier

Opp2

Where in the value chain does the opportunity occur?

Direct operations

Opportunity type

Products and services

Primary climate-related opportunity driver

Other

Type of financial impact

Other, please specify
Investment in grid assets

Company-specific description

An increase in distributed energy resources and private renewable energy pose a reliability challenge to delivery networks, giving rise to the opportunity to make enhancements to the grid needed to connect more renewable and low-carbon generation sources. Such projects support long-term earnings growth and have typically offered favorable returns on investment.

Time horizon

Current

Likelihood

Virtually certain

Magnitude of impact

Medium-high

Are you able to provide a potential financial impact figure?

No, we do not have this figure

Potential financial impact figure (currency)

Potential financial impact figure – minimum (currency)

Potential financial impact figure – maximum (currency)

Explanation of financial impact figure

The magnitude of financial impact reflects the return expected on investments needed to enhance and modernize the grid, including transmission and distribution enhancements from 2019 - 2023. This covers both Opportunity 1 and Opportunity 2.

Strategy to realize opportunity

In Pennsylvania and Kentucky, PPL’s utilities conduct planning studies based on sensitivity analyses looking at impacts to the system from renewables and distributed generation under various scenarios including peak load, minimum load and regional load. These studies inform decisions on grid enhancements, including smart meters, to enable increased renewables and distributed generation without increased service disruptions.

In Pennsylvania, PPL EU is also engaged in the Keystone Solar project to understand how best to control distributed generation on the system. PPL EU also successfully supported legislation on alternative rates which would enable greater flexibility in making investments towards a stronger and more reliable grid.

WPD is transitioning from a Distribution Network Operator to a Distribution System Operator in order to more proactively support increased customer adoption of low-carbon technologies.

Cost to realize opportunity

2,800,000,000

Comment

Opportunity to earn a return on investments in modernizing and strengthening the grid in all of PPL’s operating areas.

PPL is planning to invest approximately \$15 billion from 2019 through 2023 in infrastructure improvements to modernize and strengthen its grid in the U.K., Kentucky and Pennsylvania.

Identifier

Opp3

Where in the value chain does the opportunity occur?

Direct operations

Opportunity type

Energy source

Primary climate-related opportunity driver

Other

Type of financial impact

Other, please specify

Investment in cleaner generation

Company-specific description

Increased demand for renewable energy in Kentucky could enhance customer interest in new solar subscription and onsite solar development options offered by LGE and KU. In addition, our Kentucky utilities will have opportunities to invest in more renewables and natural gas as coal-fired power plants retire, electricity demand increases or future environmental regulations accelerate a transition to less carbon-intense power generation.

Greater electrification of the economy to reduce carbon, in particular the widespread adoption of electric vehicles and the electrification of industries previously powered by fossil fuels, could support increased electricity sales and require additional investments in distribution networks. This could support long-term earnings growth and favorable returns on investment.

Time horizon

Current

Likelihood

Virtually certain

Magnitude of impact

Low

Are you able to provide a potential financial impact figure?

No, we do not have this figure

Potential financial impact figure (currency)

Potential financial impact figure – minimum (currency)

Potential financial impact figure – maximum (currency)

Explanation of financial impact figure

Current impacts are low and have not been calculated. Investments in renewables and lower-carbon generation provides an opportunity for long-term earnings growth and favorable returns so long as the investments are determined to be prudent by the regulators.

Strategy to realize opportunity

This is included in LGE and KU's integrated resources planning process. LGE and KU maintain ongoing engagement with regulators, policymakers and customers, with an eye toward economic development and accurately gauging shifting customer preferences

Cost to realize opportunity

Comment

Opportunity in Kentucky to invest in renewable energy and lower-carbon generation.

Identifier

Opp4

Where in the value chain does the opportunity occur?

Customer

Opportunity type

Products and services

Primary climate-related opportunity driver

Other

Type of financial impact

Other, please specify

Greater demand for power and delivery

Company-specific description

Greater electrification of the economy to reduce carbon, in particular the widespread adoption of electric vehicles and the electrification of industries previously powered by fossil fuels, could support increased electricity sales and require additional investments in distribution networks. This could support long-term earnings growth and favorable returns on investment.

Time horizon

Medium-term

Likelihood

Very likely

Magnitude of impact

Medium-low

Are you able to provide a potential financial impact figure?

No, we do not have this figure

Potential financial impact figure (currency)

Potential financial impact figure – minimum (currency)

Potential financial impact figure – maximum (currency)

Explanation of financial impact figure

Too speculative to estimate financial impact of this opportunity.

Strategy to realize opportunity

PPL is making system enhancements necessary to meet electricity demand over the long-term to support the adoption of electric-fueled transportation and is also adding electric vehicles to its fleet. WPD is taking a proactive approach with Electric Nation, a two-year project to study the impact of electric vehicles on electricity networks. LGE and KU gained regulatory approval to install new electric vehicle charging infrastructure both in public access areas and for business customers. PPL EU has acquired electric vehicles to study their impact on the grid and has engaged with policymakers on ownership of electric vehicle charging stations.

Cost to realize opportunity**Comment**

Greater electrification of the economy to reduce carbon could increase electricity sales and demand for power delivery. Cost to realize the opportunity has not been determined corporate-wide.

Identifier

Opp5

Where in the value chain does the opportunity occur?

Investment chain

Opportunity type

Products and services

Primary climate-related opportunity driver

Ability to diversify business activities

Type of financial impact

Increased revenue through demand for lower emissions products and services

Company-specific description

New business opportunity in the unregulated renewable and distributed energy space to support the growth of distributed energy resources, including solar and energy storage solutions driven by customer demand and favorable policies.

Time horizon

Current

Likelihood

Very likely

Magnitude of impact

Low

Are you able to provide a potential financial impact figure?

No, we do not have this figure

Potential financial impact figure (currency)

Potential financial impact figure – minimum (currency)

Potential financial impact figure – maximum (currency)

Explanation of financial impact figure

Too speculative to estimate financial impact of this opportunity.

Strategy to realize opportunity

Strategy groups across the company evaluate different options to inform business strategy, using modeling and input from our internal experts and third parties as needed. Ultimately, these assessments inform our business strategy at the enterprise level as well as the operating company level. At the enterprise level, input from these strategy groups (including input on the growth of distributed energy resources) resulted in the company decision in 2018 to acquire Safari Energy, a leading provider of solar energy solutions for commercial customers in the United States.

Cost to realize opportunity

100,000,000

Comment

Current activities total under \$100 million.

Identifier

Opp6

Where in the value chain does the opportunity occur?

Investment chain

Opportunity type

Products and services

Primary climate-related opportunity driver

Other

Type of financial impact

Other, please specify

Investment in additional transmission facilities

Company-specific description



Increased interest in renewables generated in remote areas may drive the need for additional transmission lines in which PPL’s competitive transmission business can invest.

Time horizon

Medium-term

Likelihood

About as likely as not

Magnitude of impact

Low

Are you able to provide a potential financial impact figure?

No, we do not have this figure

Potential financial impact figure (currency)

Potential financial impact figure – minimum (currency)

Potential financial impact figure – maximum (currency)

Explanation of financial impact figure

Too speculative to estimate financial impact of this opportunity as it depends upon whether, where and when future development may occur.

Strategy to realize opportunity

PPL created a competitive transmission business to take advantage of this opportunity should it arise.

Cost to realize opportunity

Comment

C2.5

(C2.5) Describe where and how the identified risks and opportunities have impacted your business.

	Impact	Description
Products and services	Impacted	The reliability of PPL’s electric service is at risk of being impacted by increasingly frequent severe storm events as well as the increase in distributed energy resources and private renewable energy. This poses a risk of adversely affecting PPL’s reputation and future rate recovery but also presents the opportunity to invest in modernizing the grid with more storm-resistant materials,

		<p>increased redundancies, automated systems and more data-driven management of the grid. PPL is also making enhancements necessary to meet electricity demand over the longer-term to support the adoption of electricity-fueled transportation.</p> <p>In addition to grid enhancements, PPL is offering new types of products and services in response to increasing public desire for renewable energy. LGE and KU have recently built the largest universal solar facility in Kentucky and have begun construction of a community solar site. WPD is transitioning from a Distribution Network Operator to a Distribution System Operator which will allow WPD to more proactively support customer adoption of low-carbon technologies. In 2018, PPL acquired Safari Energy, a leading provider of solar energy solutions for commercial customers in the United States.</p>
<p>Supply chain and/or value chain</p>	<p>Impacted for some suppliers, facilities, or product lines</p>	<p>PPL EU requires electricity suppliers to provide sufficient renewable energy credits to allow PPL EU to meet Pennsylvania's Alternative Energy Portfolio Standards requirements. In 2019, LGE and KU issued a request for proposal to energy suppliers for renewable energy.</p>
<p>Adaptation and mitigation activities</p>	<p>Impacted</p>	<p>PPL is adapting to both physical risks as well as transition risks through a variety of initiatives to reduce its carbon footprint, enhance the grid, and bring power generation back on line more quickly. We are making significant investments in grid reliability and resilience, recognizing that increased renewables on the grid as well as increasingly frequent severe storms require a more modern and flexible grid.</p> <p>In 2018, our operating companies invested about \$3.3 billion in infrastructure improvements, the bulk of which was for transmission and distribution. Under our business plans, we are on track to invest an additional approximately \$15 billion through 2023 in projects that include strengthening reliability, making the grid smarter, more resilient, and capable of accommodating more renewable energy. WPD has facilitated the transition to a decentralized energy system by re-engineering its networks, which were designed for 14 GW of demand, to enable them to accommodate 20 GW of renewable generation.</p> <p>In 2018, PPL acquired Safari Energy, a leading provider of solar energy solutions for commercial customers in the United States.</p> <p>Overall, our strategy going forward is to continue to grow our non-carbon-based transmission and distribution portfolio, economically retire our coal fired generation fleet and reduce the carbon intensity of our generation, increase our investment in renewables and</p>

		distributed energy resources, and invest in new technologies to make the grid more reliable, dynamic and resilient. As part of this strategy PPL regularly engages with our regulators and advocates for regulatory structures that support the transformation of our industry to a cleaner energy future.
Investment in R&D	Impacted	<p>PPL is a long-time member of the Electric Power Research Institute (EPRI) which conducts research and development on a variety of electric sector topics including climate change, carbon capture and electrification.</p> <p>LGE and KU have created a new Energy Storage Research and Demonstration Site to continue developing large-scale battery storage technologies.</p> <p>PPL EU is participating in the Keystone Solar Future Project which leverages several different grid technologies to develop a distributed system platform that bridges the gap between existing and future technologies by monitoring, controlling, and optimizing high penetration of solar generation. PPL EU is also developing a multi-layer device and communication architecture and a 500-customer pilot on at least 10 distribution circuits.</p> <p>WPD participates in the U.K. Network Innovation Allowance and Competitions, which has launched projects that test innovative methods to enable the widespread adoption by customers of low-carbon technologies. This includes technology such as solar panels, heat pumps and electric vehicles. Projects underway include Electric Nation, which has piloted electric vehicle usage on a large scale to determine impacts on the grid and required investments to support electric vehicle deployment.</p>
Operations	Impacted for some suppliers, facilities, or product lines	Operational impacts are primarily related to enhancing and managing the grid in all of PPL’s service areas to meet the growing demand for renewable energy, and to address physical risks from increasingly frequent severe storms. WPD’s operations will be significantly altered when it completes its transition from Distribution Network Operator to Distribution System Operator.
Other, please specify		

C2.6

(C2.6) Describe where and how the identified risks and opportunities have been factored into your financial planning process.

	Relevance	Description
Revenues	Impacted	Revenue impact has primarily been positive as PPL's costs and investments are overseen by utility regulators, and PPL is allowed to recover prudently incurred costs and a reasonable return on prudent investments.
Operating costs	Impacted	PPL's costs have increased due to both physical and transitional impacts. To date, PPL has been allowed to recover its prudently incurred costs.
Capital expenditures / capital allocation	Impacted	PPL's capital plans include approximately \$15 billion for grid enhancements as well as additional capital for renewable generation and low carbon products and services listed in response to item C-EU9.5a and C-EU 9.5b.
Acquisitions and divestments	Impacted	PPL acquired Safari Energy in May 2018 to support the growth of distributed energy resources, including energy storage, and to gain additional experience with technology that will play a bigger role in shaping the future energy grid.
Access to capital	Not yet impacted	Although PPL's carbon footprint has been the subject of discussion with some investors, it has not yet precluded PPL from obtaining financing or resulted in financing costs that were not recoverable in customer rates.
Assets	Impacted	<p>PPL is changing its asset mix to grow our non-carbon-based transmission and distribution portfolio, economically retire coal-fired generation, increase our investment in renewables and distributed energy resources, and invest in new technologies to make the grid more reliable.</p> <p>In 2015, PPL significantly reduced the power generation component of its portfolio by spinning off its merchant generation business. In 2018, PPL acquired Safari Energy, a leading provider of solar energy solutions for commercial customers in the United States.</p> <p>In 2018, our operating companies invested about \$3.3 billion in infrastructure improvements, the bulk of which was for transmission and distribution. Under our business plans, we are on track to invest an additional approximately \$15 billion through 2023 primarily for renewable generation, low-carbon products and services, and grid enhancement projects that strengthen reliability, make the grid smarter, more resilient, and capable of accommodating more renewable energy.</p>
Liabilities	We have not identified any	Description of risks and opportunities is provided in Sections C2.3a and C2.4a.

	risks or opportunities	
Other	Impacted	

C3. Business Strategy

C3.1

(C3.1) Are climate-related issues integrated into your business strategy?

Yes

C3.1a

(C3.1a) Does your organization use climate-related scenario analysis to inform your business strategy?

Yes, qualitative and quantitative

C-AC3.1b/C-CE3.1b/C-CH3.1b/C-CO3.1b/C-EU3.1b/C-FB3.1b/C-MM3.1b/C-OG3.1b/C-PF3.1b/C-ST3.1b/C-TO3.1b/C-TS3.1b

(C-AC3.1b/C-CE3.1b/C-CH3.1b/C-CO3.1b/C-EU3.1b/C-FB3.1b/C-MM3.1b/C-OG3.1b/C-PF3.1b/C-ST3.1b/C-TO3.1b/C-TS3.1b) Indicate whether your organization has developed a low-carbon transition plan to support the long-term business strategy.

Yes

C3.1c

(C3.1c) Explain how climate-related issues are integrated into your business objectives and strategy.

Climate-related issues are assessed and integrated in business objectives and strategy at various levels throughout the company. Strategy groups across our company evaluate different options to inform business strategy, using modeling and input from our internal experts and third parties as needed. Ultimately, these assessments inform our business strategy at the enterprise level as well as the operating company level.

At the operating company level, multi-disciplinary teams research, evaluate and model changing business conditions, including physical and transition risks related to climate change. These assessments drive the operating company's business plans. For example, we are making significant investments in grid reliability and resilience, recognizing that increased renewables on the grid as well as increasingly frequent severe storms require a more modern and flexible grid. In 2018, our operating companies invested about \$3.3 billion, the bulk of which was invested in transmission and distribution infrastructure improvements. Under our

business plans, we are on track to invest an additional approximately \$15 billion through 2023 in projects that strengthen reliability, make the grid smarter and more resilient, and capable of accommodating more renewable energy.

At the enterprise level, input from our strategy groups (including input on climate-related issues) resulted in PPL’s decision to strategically restructure the corporation in 2015, significantly reducing the power generation component of its portfolio. In 2018, PPL acquired Safari Energy, a leading provider of solar energy solutions for commercial customers in the United States. Overall, our strategy going forward is to continue to grow our non-carbon based transmission and distribution portfolio, economically reduce the carbon intensity of our generation portfolio, increase our investment in renewables and distributed energy resources, and invest in new technologies to make the grid more reliable, dynamic and resilient. An important component of this strategy is to continue to keep ourselves informed about the expectations of our regulators and to advocate for regulatory structures that support the transformation of our industry to a cleaner energy future.

C3.1d

(C3.1d) Provide details of your organization’s use of climate-related scenario analysis.

Climate-related scenarios	Details
<p>IEA 450</p> <p>Other, please specify</p> <p>Each operating company uses its own in-house scenario analysis.</p>	<p>Climate-related scenario analyses and predictive analytics are used at the enterprise level as well as at the operating company level. At the enterprise level, these analyses guide overall business investment and strategy. At the operating company level, these analyses guide operational strategies and decisions.</p> <p>In 2017, PPL conducted a detailed assessment of how future requirements and technological advances aimed at limiting global warming to 2 degrees Celsius above pre-industrial levels could impact PPL. In conducting the assessment, PPL considered the recommendations of the Task Force on Climate-Related Financial Disclosures. The assessment examined several policy and technology scenarios, including a scenario consistent with limiting global temperatures to an increase of 2 degrees Celsius over pre-industrial levels. A report of the assessment is publicly available on PPL’s web site.</p> <p>At the operating company level, all companies monitor their reliability performance and conduct planning analyses of their systems, looking at trends in weather, vegetation management and other impacts to system reliability under various scenarios. For example, as part of these analyses in Pennsylvania, PPL EU is replacing many of its wooden poles with steel structures and is adding more redundancies to the system.</p>

C-AC3.1e/C-CE3.1e/C-CH3.1e/C-CO3.1e/C-EU3.1e/C-FB3.1e/C-MM3.1e/C-OG3.1e/C-PF3.1e/C-ST3.1e/C-TO3.1e/C-TS3.1e

(C-AC3.1e/C-CE3.1e/C-CH3.1e/C-CO3.1e/C-EU3.1e/C-FB3.1e/C-MM3.1e/C-OG3.1e/C-PF3.1e/C-ST3.1e/C-TO3.1e/C-TS3.1e) Disclose details of your organization's low-carbon transition plan.

The Company's low-carbon transition plan recognizes the need to reduce our carbon footprint and to be prepared for the transition to a more energy-efficient and lower-carbon economy. As a result, we have committed to reducing our carbon dioxide emissions by 70% from 2010 levels by 2050, largely through economic retirements of our coal-fired plants in Kentucky and replacing needed generation with a mix of cleaner sources. In Kentucky, we own and operate the state's largest universal solar array and have business solar offerings for commercial and industrial customers, an innovative subscription-based community solar program. We are using real-time data from the solar array to inform future decisions to optimize the use of solar in our generation mix. We are also seeking renewable energy proposals that meet the least cost regulatory hurdle from suppliers to provide additional renewable energy options to customers.

Some of our operations have also established their own individual goals to reduce their carbon footprint. WPD for example has committed to reducing its business carbon footprint 5 percent from 2012-2013 levels by 2023. In 2018, WPD's total business carbon footprint was reduced from 92,918 tCO₂e to 85,528 tCO₂e.

In addition to our carbon reductions, we are preparing for a cleaner energy future by growing our non-carbon-based transmission and distribution portfolio and enabling our customers to be more energy efficient and to reduce their carbon footprint. In Pennsylvania, this includes meeting increasingly stringent renewable portfolio standards for power that PPL EU is required to purchase on behalf of its customers. It also includes mandated programs to progressively increase customer energy efficiency and reduce peak demand as determined by the utility regulator to be cost effective.

Our U.K. and Pennsylvania utilities are also investing in new technologies and improvements to the grid to accommodate more low-carbon distributed generation and renewable energy. In Pennsylvania our plan includes research on solar and other distributed energy resources and installing the next generation of meters for customers in order to detect and respond faster to changing conditions on the grid.

In Kentucky, we are participating in a Green Energy program that allows utilities to purchase regional renewable energy credits on a customer's behalf. We are also proposing to offer a "Green Tariff" to further promote renewable energy growth. In the U.K., our plan includes transitioning from a Distribution Network Operator to a Distribution System Operator in order to drive performance and efficiency.

Finally, in 2018 we acquired Safari Energy, a leading provider of solar energy solutions for commercial customers in the United States.

C4. Targets and performance

C4.1

(C4.1) Did you have an emissions target that was active in the reporting year?

Absolute target

C4.1a

(C4.1a) Provide details of your absolute emissions target(s) and progress made against those targets.

Target reference number

Abs 1

Scope

Other, please specify

Scope 1 + 2 (location and market based)

% emissions in Scope

99.9

Targeted % reduction from base year

70

Base year

2010

Start year

2017

Base year emissions covered by target (metric tons CO₂e)

62,577,296

Target year

2050

Is this a science-based target?

No, and we do not anticipate setting one in the next 2 years

% of target achieved

52.26

Target status

Underway

Please explain

PPL's 2050 goal was publicly announced in January 2018. As discussed in PPL's scenario-based climate assessment report released in November 2017, the Kentucky subsidiaries will likely economically retire the bulk of their coal-fired units by 2050, even absent future carbon regulation. Emissions from generation account for the majority of PPL's overall carbon emissions. PPL plans to achieve additional emissions reductions across its U.S. and U.K. business, with Pennsylvania and U.K. subsidiaries focused solely on reductions related to delivering electricity. Steps will include reducing greenhouse gas emissions at substations through monitoring and proactive equipment replacements; improving energy efficiency at company facilities; and transitioning to a cleaner fleet of trucks and vehicles. In addition to these goal-related steps in 2018, PPL is deploying solar and storage projects at Safari Energy. Regarding calculation of Scope 2 emissions, LGE and KU's emissions are calculated using a hybrid of location based and market-based factors. LGE and KU have access to location-based factors for power procured from specific contracted units. LGE and KU also purchase a small amount of power in the wholesale market. Emissions associated with all electric and gas use in buildings across all operations (LGE, KU, PPL EU and WPD) are calculated based on market-based factors.

C4.2

(C4.2) Provide details of other key climate-related targets not already reported in question C4.1/a/b.

Target

Energy usage

KPI – Metric numerator

WPD - Reduce technical network losses.

KPI – Metric denominator (intensity targets only)

N/A

Base year

2012

Start year

2015

Target year

KPI in baseline year

5,158

KPI in target year

3,918

% achieved in reporting year

0

Target Status

Underway

Please explain

KPI's are in GWh and this is an initiative to reduce network losses to 3,918 GWh's per year, with no target year. Install oversize transformers when replacing assets in areas where demand for power may become higher than our equipment can cope with - WPD have installed 30 oversized transformers in 2017.

Use larger cables when installing new network in Low Carbon Technologies (LCT) hotspots - WPD have installed 337 metres of cable in LCT hotspots in 2017.

WPD's reporting year runs on the regulatory year: 1st April - 30th March

Part of emissions target

N/A

Is this target part of an overarching initiative?

No, it's not part of an overarching initiative

Target

Other, please specify
Climate Change Mitigation and Adaptation

KPI – Metric numerator

WPD - Climate change adaptation activities - substation protection against flooding.

KPI – Metric denominator (intensity targets only)

N/A

Base year

2010

Start year

2014

Target year

2026

KPI in baseline year

79

KPI in target year

234

% achieved in reporting year

100

Target Status

Underway

Please explain

Apply flood defenses to 75 substations, reducing the risk of both damage to equipment and power cuts due to flooding. During ED1 (the current price control), we have to date installed flood defenses at 27 substations. We have carried out data analysis and site surveys at a further 97 substations.

Part of emissions target

N/A

Is this target part of an overarching initiative?

No, it's not part of an overarching initiative

Target

Waste

KPI – Metric numerator

PPL EU - Increase percentage recycling and reuse of wood poles and other wood wastes.

KPI – Metric denominator (intensity targets only)

N/A

Base year

2015

Start year

2017

Target year

2018

KPI in baseline year

72.3

KPI in target year

99.8

% achieved in reporting year

100

Target Status

Underway

Please explain

Trending KPI

The target is measured against 3-year average of 2015, 2016 and 2017.

Part of emissions target

N/A

Is this target part of an overarching initiative?

No, it's not part of an overarching initiative

C4.3

(C4.3) Did you have emissions reduction initiatives that were active within the reporting year? Note that this can include those in the planning and/or implementation phases.

Yes

C4.3a

(C4.3a) Identify the total number of initiatives at each stage of development, and for those in the implementation stages, the estimated CO2e savings.

	Number of initiatives	Total estimated annual CO2e savings in metric tonnes CO2e (only for rows marked *)
Under investigation	3	
To be implemented*	2	
Implementation commenced*	4	5,182
Implemented*	9	920,093.9
Not to be implemented	0	0

C4.3b

(C4.3b) Provide details on the initiatives implemented in the reporting year in the table below.

Initiative type

Other, please specify
Alternative Energy Portfolio

Description of initiative

Estimated annual CO2e savings (metric tonnes CO2e)

265,077

Scope

Scope 3

Voluntary/Mandatory

Mandatory

Annual monetary savings (unit currency – as specified in C0.4)

Investment required (unit currency – as specified in C0.4)

Payback period

No payback

Estimated lifetime of the initiative

Ongoing

Comment

PPL EU - Alternative Energy Portfolio Standards Act requires Pennsylvania's Electric Distribution Companies (EDC's) to purchase a set amount of power from alternative sources like solar, wind and biofuels. By 2021, companies will need to purchase eight percent of their overall power from "tier 1" renewable energy sources.

This program does not have an associated payback period.

Initiative type

Other, please specify
Energy Efficiency: Act 129

Description of initiative

Estimated annual CO2e savings (metric tonnes CO2e)

505,923

Scope

Scope 3

Voluntary/Mandatory

Mandatory

Annual monetary savings (unit currency – as specified in C0.4)

23,795,380

Investment required (unit currency – as specified in C0.4)

57,182,010

Payback period

No payback

Estimated lifetime of the initiative

11-15 years

Comment

PPL EU - Act 129 legislation, which became effective in November 2008, requires EDC's to cost-effectively reduce electricity consumption and peak demand on their systems.

New energy efficiency plans need to be submitted to regulator.

Payback period is applicable only to customers and varies based on each project.

Initiative type

Low-carbon energy installation

Description of initiative

Solar PV

Estimated annual CO2e savings (metric tonnes CO2e)

39

Scope

Scope 1

Voluntary/Mandatory

Voluntary

Annual monetary savings (unit currency – as specified in C0.4)

6,700,000

Investment required (unit currency – as specified in C0.4)

Payback period

No payback

Estimated lifetime of the initiative

Ongoing

Comment

LGE and KU - Business Solar Program: developing partnership with Archdiocese of Louisville.

LGE and KU generates and delivers electricity, as such these initiatives directly reduce Scope 1 emissions.

Investment and payback calculated on a project-specific basis.

Initiative type

Other, please specify
Demand Side Management Programs

Description of initiative

Estimated annual CO₂e savings (metric tonnes CO₂e)

143,665

Scope

Scope 1

Voluntary/Mandatory

Voluntary

Annual monetary savings (unit currency – as specified in C0.4)

Investment required (unit currency – as specified in C0.4)

44,000,000

Payback period

No payback

Estimated lifetime of the initiative

6-10 years

Comment

LGE and KU- In 2017 LGE and KU invested \$44M in Demand Side Management Programs, which includes:
Residential energy audits,
Residential winterization,
Residential appliance rebates,
Residential behavior programs,
Residential demand response,
Residential education programs, and Commercial programs

LGE and KU generates and delivers electricity, as such these initiatives directly reduced Scope 1 emissions.

Payback period is applicable only to customers and varies based on each project.

Initiative type

Energy efficiency: Building fabric

Description of initiative

Other, please specify

Combination of measures to achieve improved energy efficiency

Estimated annual CO2e savings (metric tonnes CO2e)

4,435.9

Scope

Scope 2 (market-based)

Voluntary/Mandatory

Voluntary

Annual monetary savings (unit currency – as specified in C0.4)

105,210

Investment required (unit currency – as specified in C0.4)

Payback period

4 - 10 years

Estimated lifetime of the initiative

3-5 years

Comment

WPD is committed to achieving an “excellent” energy rating under Building Research Establishment Environmental Assessment Method (BREEAM) for all its new buildings and a “very good” rating under BREEAM for all buildings it is refurbishing. BREEAM is the world's longest established method of assessing, rating and certifying the sustainability of buildings. These are the highest ratings that can be achieved for each category. This has resulted in energy use reduction for WPD’s buildings of 36.9% since 2012-13.

Initiative type

Other, please specify

Electric Bucket Trucks

Description of initiative

Estimated annual CO2e savings (metric tonnes CO2e)

954

Scope

Scope 1

Voluntary/Mandatory

Voluntary

Annual monetary savings (unit currency – as specified in C0.4)

2,308,333

Investment required (unit currency – as specified in C0.4)

13,850,000

Payback period

4 - 10 years

Estimated lifetime of the initiative

Ongoing

Comment

PPL EU is converting its bucket trucks to electric-lift trucks, which reduces fuel emissions. The goal is to replace all 277 bucket trucks with this technology by the end of 2025.

Initiative type

Fugitive emissions reductions

Description of initiative

Other, please specify
Reduction of SF6 Emissions

Estimated annual CO2e savings (metric tonnes CO2e)

4,792

Scope

Scope 1

Voluntary/Mandatory

Voluntary

Annual monetary savings (unit currency – as specified in C0.4)

0

Investment required (unit currency – as specified in C0.4)

Payback period

No payback

Estimated lifetime of the initiative

Ongoing

Comment



Reductions are the 8-year average reduction in 2018 emissions compared to 2010 emissions. LGE and KU are replacing equipment to reduce SF6 emissions. Payback not yet calculated.

Initiative type

Fugitive emissions reductions

Description of initiative

Other, please specify
Reduction of SF6 Emissions

Estimated annual CO2e savings (metric tonnes CO2e)

3,738

Scope

Scope 1

Voluntary/Mandatory

Voluntary

Annual monetary savings (unit currency – as specified in C0.4)

Investment required (unit currency – as specified in C0.4)

Payback period

No payback

Estimated lifetime of the initiative

Ongoing

Comment

Reductions are the 8-year average reduction in 2018 emissions compared to 2010 emissions. Since 2014, PPL EU has improved its leak rate faster than industry peers while increasing the total SF6 gas on the system by 93% and decreasing losses by 68% for an overall leak rate reduction of 84%. Based on the latest EPA benchmark data, this is 6th best in the country and top decile performance.

Payback period not yet calculated.

C4.3c

(C4.3c) What methods do you use to drive investment in emissions reduction activities?

Method	Comment
--------	---------

Compliance with regulatory requirements/standards	PPL determines and implements across its Pennsylvania, U.K., and Kentucky operations the least life cycle cost for compliance with federal, state, and local requirements.
Dedicated budget for energy efficiency	Under Pennsylvania’s Act 129, PPL EU has a \$312.5 million budget over 5 years for a program to incentivize its customers to install more energy-efficient lighting, HVAC equipment, motors, etc.
Financial optimization calculations	PPL conducts strategic reviews of its operations to select financially optimal solutions.
Partnering with governments on technology development	<p>PPL EU’s Keystone Solar Future Project is a three-year project funded in part by a grant from the U.S. Department of Energy. The project includes a number of private and public-sector partners to evaluate management of high levels of DR and the value of an integrated grid.</p> <p>Within the U.K., Distribution Network Operators (DNOs) have a budget through the Low Carbon Networks Fund (LCNF) and Network Innovation Allowance. This allows DNOs to test out new technology, operating and commercial arrangements. The aim of the projects is to help all DNOs understand how they can provide security of supply at value for money as Britain moves to a low carbon economy. Within this funding mechanism WPD have delivered 19 projects under the LCNF and another 34 under the Network Innovation provisions.</p>
Dedicated budget for low-carbon product R&D	LGE and KU has a dedicated budget for Research and Development related to battery storage operations and maintenance.
Dedicated budget for other emissions reduction activities	Within the U.K., DNOs have a budget through the Low Carbon Networks Fund (LCNF) and Network Innovation Allowance. This allows DNOs to test out new technology, operating and commercial arrangements. The aim of the projects is to help all DNOs understand how they can provide security of supply at value for money as Britain moves to a low carbon economy. Within this funding mechanism WPD has delivered 19 projects under the LCNF and another 34 under the Network Innovation provisions.

C4.5

(C4.5) Do you classify any of your existing goods and/or services as low-carbon products or do they enable a third party to avoid GHG emissions?

Yes

C4.5a

(C4.5a) Provide details of your products and/or services that you classify as low-carbon products or that enable a third party to avoid GHG emissions.

Level of aggregation

Product

Description of product/Group of products

Customer Energy Efficiency and Demand Side Management Services

Are these low-carbon product(s) or do they enable avoided emissions?

Avoided emissions

Taxonomy, project or methodology used to classify product(s) as low-carbon or to calculate avoided emissions

Other, please specify

Avoided emissions based on reduced consumption of electricity

% revenue from low carbon product(s) in the reporting year

0

Comment

These services include energy audits, winterization, appliance rebates, demand response and education to modify energy consumption behaviors. These services reduce revenue due to reduced use of our product (electricity).

Level of aggregation

Product

Description of product/Group of products

Alternative Energy Portfolio

Are these low-carbon product(s) or do they enable avoided emissions?

Low-carbon product and avoided emissions

Taxonomy, project or methodology used to classify product(s) as low-carbon or to calculate avoided emissions

Other, please specify

Power from low-carbon sources

% revenue from low carbon product(s) in the reporting year

0

Comment

PPL EU - The Alternative Energy Portfolio Standards Act requires Pennsylvania Electric Distribution Companies to purchase a set amount of power from alternative sources like solar, wind and biofuels. By 2021 this must be 8% from "tier 1" renewable sources. These services have no impact on revenue.

Level of aggregation

Product

Description of product/Group of products

Low-carbon energy

Are these low-carbon product(s) or do they enable avoided emissions?

Low-carbon product and avoided emissions

Taxonomy, project or methodology used to classify product(s) as low-carbon or to calculate avoided emissions

Other, please specify
Solar PV

% revenue from low carbon product(s) in the reporting year

0

Comment

LGE and KU's Business Solar Program: developing partnership with Archdiocese of Louisville.

Level of aggregation

Product

Description of product/Group of products

Low-carbon energy

Are these low-carbon product(s) or do they enable avoided emissions?

Low-carbon product and avoided emissions

Taxonomy, project or methodology used to classify product(s) as low-carbon or to calculate avoided emissions

Other, please specify
Community solar

% revenue from low carbon product(s) in the reporting year

0

Comment

LGE and KU are providing customers the opportunity to purchase low-carbon energy through participating in LGE and KU's community solar program.

Level of aggregation

Product

Description of product/Group of products

Low-carbon network

Are these low-carbon product(s) or do they enable avoided emissions?

Avoided emissions

Taxonomy, project or methodology used to classify product(s) as low-carbon or to calculate avoided emissions

Other, please specify

Plug-in vehicles

% revenue from low carbon product(s) in the reporting year

0

Comment

WPD Electric Nation project enhancing use of plug-in vehicles to cost-effectively provide demand control services.

Level of aggregation

Product

Description of product/Group of products

Low-carbon energy purchase

Are these low-carbon product(s) or do they enable avoided emissions?

Low-carbon product and avoided emissions

Taxonomy, project or methodology used to classify product(s) as low-carbon or to calculate avoided emissions

Other, please specify

Enabling commercial use of renewables

% revenue from low carbon product(s) in the reporting year

0

Comment

New systems and contracts with commercial customers to allow WPD to sell aggregated renewable capacity into other DSR schemes.

Level of aggregation

Product

Description of product/Group of products

Fugitive emission reduction

Are these low-carbon product(s) or do they enable avoided emissions?

Avoided emissions

Taxonomy, project or methodology used to classify product(s) as low-carbon or to calculate avoided emissions

Other, please specify

Enhancing integrity of gas system

% revenue from low carbon product(s) in the reporting year

0

Comment

LGE and KU are using advanced in-line inspection tools to more quickly and effectively identify gas leaks.

C-EU4.6

(C-EU4.6) Describe your organization's efforts to reduce methane emissions from your activities.

LGE is reducing methane emissions through its regular leak surveys and gas riser inspection and replacement program. The utility also announced last fall its plans to expand infrastructure upgrades within its natural gas system which include:

- Replacing aging steel service lines, with new plastic pipe;

- LGE is implementing a Kentucky Public Service Commission-approved program to replace approximately 45,000 steel customer service lines. The steel customer service lines are largely 30 to 35 years old or greater and susceptible to corrosion leaks. LGE has replaced several hundred of these services annually in a reactive fashion and developed this program to accelerate their replacement in a programmatic fashion.

- Replacing aging natural gas transmission lines;

- LGE is implementing a Kentucky Public Service Commission-approved Transmission Modernization program to replace approximately 15.5 miles of transmission pipeline in Jefferson County. The transmission line is 45 – 60 years old. This is the first phase of the Transmission Modernization Program and construction is just starting on this work. It is anticipated the project will be largely complete by the end of 2020.

- Upgrades to city gate stations and gas regulation facilities with new valves, piping, and modern regulation and measurement equipment.

A gas main replacement program will wrap up an initiative the utility began implementing in its system back in 1996 as it established a program committing to replacing 540 miles of cast iron, wrought iron and bare steel natural gas pipelines, which are more vulnerable to degradation over time. These lines will be replaced primarily with more durable plastic natural gas pipelines. The facility portion of this project was completed in 2017 with some restoration completed in 2018.

Gas Distribution Operations complies with all Pipeline and Hazardous Materials Safety Administration (PHMSA) and state regulatory requirements to prevent gas release.

C5. Emissions methodology

C5.1

(C5.1) Provide your base year and base year emissions (Scopes 1 and 2).

Scope 1

Base year start

January 1, 2010

Base year end

December 31, 2010

Base year emissions (metric tons CO₂e)

60,906,564

Comment

Scope 1 (Gross): 60,736,086 + Scope 1 (Fleet Vehicles): 48,343 + Scope 1 (Small Plant Stationary): 2,515 + Scope 1 (Plant Mobile Equipment): 4,893 + Scope 1 (SF6): 114,727

Scope 2 (location-based)

Base year start

January 1, 2010

Base year end

December 31, 2010

Base year emissions (metric tons CO₂e)

1,252,638

Comment

Estimated location-based CO₂ emissions.

Scope 2 (market-based)

Base year start

January 1, 2010

Base year end

December 31, 2010

Base year emissions (metric tons CO₂e)

344,519

Comment

Estimated market-based CO₂ emissions.

C5.2

(C5.2) Select the name of the standard, protocol, or methodology you have used to collect activity data and calculate Scope 1 and Scope 2 emissions.

Defra Voluntary 2017 Reporting Guidelines

US EPA Mandatory Greenhouse Gas Reporting Rule

C6. Emissions data

C6.1

(C6.1) What were your organization's gross global Scope 1 emissions in metric tons CO₂e?

Reporting year

Gross global Scope 1 emissions (metric tons CO₂e)

29,609,494

Start date

January 1, 2018

End date

December 31, 2018

Comment

Scope 1 (Gross): 29,480,129 + Scope 1 (Fleet Vehicles): 43,256 + Scope 1 (Small Plant Stationary): 1,097 + Scope 1 (Plant Mobile Equipment): 6,459 + Scope 1 (Gas Operations): 29,040 + Scope 1 (SF6): 49,513

Past year 1

Gross global Scope 1 emissions (metric tons CO₂e)

28,587,423

Start date

January 1, 2017

End date

December 31, 2017

Comment

Scope 1 (Gross): 28,407,677 + Scope 1 (Fleet Vehicles): 47,630 + Scope 1 (Small Plant Stationary): 8,984 + Scope 1 (Plant Mobile Equipment): 4,893 + Scope 1 (Gas Operations): 28,132 + Scope 1 (SF6): 90,107

Past year 2

Gross global Scope 1 emissions (metric tons CO₂e)

28,941,770

Start date

January 1, 2016

End date

December 31, 2016

Comment

Scope 1 (Gross): 28,737,028 + Scope 1 (Fleet Vehicles): 46,633 + Scope 1 (Small Plant Stationary): 32,645 + Scope 1 (Plant Mobile Equipment): 4,893 + Scope 1 (Gas Operations): 35,376 + Scope 1 (SF6): 85,195

Past year 3

Gross global Scope 1 emissions (metric tons CO2e)

30,382,287

Start date

January 1, 2015

End date

December 31, 2015

Comment

Scope 1 (Gross): 30,199,495 + Scope 1 (Fleet Vehicles): 49,727 + Scope 1 (Small Plant Stationary): 5,610 + Scope 1 (Plant Mobile Equipment): 4,893 + Scope 1 (Gas Operations): 35,622 + Scope 1 (SF6): 86,940

C6.2

(C6.2) Describe your organization’s approach to reporting Scope 2 emissions.

Row 1

Scope 2, location-based

We are reporting a Scope 2, location-based figure

Scope 2, market-based

We are reporting a Scope 2, market-based figure

Comment

LGE and KU Scope 2 emissions are calculated using a hybrid of location based and market-based factors. LGE and KU have access to location-based factors for power procured from specific contracted units. LGE and KU also purchase a small amount of power in the wholesale market. Emissions associated with all electric and gas use in buildings across all operations (LGE, KU, PPL EU and WPD) are calculated based on market-based factors.

C6.3

(C6.3) What were your organization's gross global Scope 2 emissions in metric tons CO₂e?

Reporting year

Scope 2, location-based

238,075

Scope 2, market-based (if applicable)

35,041

Start date

January 1, 2018

End date

December 31, 2018

Comment

Past year 1

Scope 2, location-based

504,517

Scope 2, market-based (if applicable)

53,684

Start date

January 1, 2017

End date

December 31, 2017

Comment

Past year 2

Scope 2, location-based

592,499

Scope 2, market-based (if applicable)

50,926

Start date

January 1, 2016

End date

December 31, 2016

Comment

Past year 3

Scope 2, location-based

430,235

Scope 2, market-based (if applicable)

54,391

Start date

January 1, 2015

End date

December 31, 2015

Comment

C6.4

(C6.4) Are there any sources (e.g. facilities, specific GHGs, activities, geographies, etc.) of Scope 1 and Scope 2 emissions that are within your selected reporting boundary which are not included in your disclosure?

No

C6.5

(C6.5) Account for your organization's Scope 3 emissions, disclosing and explaining any exclusions.

Purchased goods and services

Evaluation status

Not evaluated

Explanation

Capital goods

Evaluation status

Not evaluated

Explanation

Fuel-and-energy-related activities (not included in Scope 1 or 2)

Evaluation status

Relevant, calculated

Metric tonnes CO₂e

3,667.3

Emissions calculation methodology

Defra conversion factors

Percentage of emissions calculated using data obtained from suppliers or value chain partners

100

Explanation

WPD Contractor / ESP fuel combustion activities

Upstream transportation and distribution

Evaluation status

Relevant, calculated

Metric tonnes CO₂e

12,130.97

Emissions calculation methodology

Defra conversion factor for standard road transport fuel kg CO₂ / unit diesel – 2.6762 / bio-diesel= 2.61163 / petrol = 2.19697

Percentage of emissions calculated using data obtained from suppliers or value chain partners

100

Explanation

WPD Contractor / ESP operational and business transport

Waste generated in operations

Evaluation status

Relevant, not yet calculated

Explanation

Primary waste would be disposal or recycling of wood poles. Not calculated because of insignificant total.

Business travel

Evaluation status

Relevant, calculated

Metric tonnes CO₂e

3,541.3

Emissions calculation methodology

Road: Total mileage data. Defra Conversion Factors (Diesel = 0.18307 and Petrol = 0.19184). Rail: collated and miles / tCO₂e calculated. Defra conversion factor (kg Co₂/km 0.04885 applied). Air: Flight miles are calculated based on Defra conversion factors. Sea: Defra conversion factor (kg CO₂ / km 0.116063).

Percentage of emissions calculated using data obtained from suppliers or value chain partners

3

Explanation

As required by the U.K. energy regulator, Office of Gas and Electricity Markets (Ofgem), the methodology for the WPD business travel carbon footprint follows U.K. Carbon Reporting guidance as provided by Defra and which is compliant with the principles of the 'Greenhouse Gas Protocol' and the annual Guidelines published Defra - GHG Conversion Factors for Company Reporting.

Employee commuting

Evaluation status

Relevant, not yet calculated

Explanation

Upstream leased assets

Evaluation status

Not evaluated

Explanation

Downstream transportation and distribution

Evaluation status

Not evaluated

Explanation

The electricity and gas that we deliver to end users is not further transported or distributed.

Processing of sold products

Evaluation status

Not relevant, explanation provided

Explanation

The electricity and gas that we deliver to end users is not further processed.

Use of sold products

Evaluation status

Relevant, calculated

Metric tonnes CO₂e

2,267,656

Emissions calculation methodology

Electric Greenhouse Gas Reporting Tool Subpart NN

Percentage of emissions calculated using data obtained from suppliers or value chain partners

0

Explanation

Value is calculated with LGE internal data for the quantity of natural gas sold.

End of life treatment of sold products

Evaluation status

Relevant, not yet calculated

Explanation

Treatment of beneficially reused coal combustion products.

Downstream leased assets

Evaluation status

Not relevant, explanation provided

Explanation

We have no downstream leased assets.

Franchises

Evaluation status

Not relevant, explanation provided

Explanation

We have no upstream or downstream franchises.

Investments

Evaluation status

Not relevant, explanation provided

Explanation

There are no upstream or downstream investments resulting in any additional CO₂e emissions.

Other (upstream)

Evaluation status

Not relevant, explanation provided

Explanation

We have no Other (upstream) CO2e emissions.

Other (downstream)

Evaluation status

Not relevant, explanation provided

Explanation

We have no Other (downstream) CO2e emissions.

C6.7

(C6.7) Are carbon dioxide emissions from biologically sequestered carbon relevant to your organization?

Yes

C6.7a

(C6.7a) Provide the emissions from biologically sequestered carbon relevant to your organization in metric tons CO2.

Row 1

Emissions from biologically sequestered carbon (metric tons CO2)

Comment

Relevant to vegetation management and siting of facilities. Not yet calculated.

C6.10

(C6.10) Describe your gross global combined Scope 1 and 2 emissions for the reporting year in metric tons CO2e per unit currency total revenue and provide any additional intensity metrics that are appropriate to your business operations.

Intensity figure

0.00384

Metric numerator (Gross global combined Scope 1 and 2 emissions)

29,873,408

Metric denominator

unit total revenue

Metric denominator: Unit total

7,785,000,000

Scope 2 figure used

Location-based

% change from previous year

1.79

Direction of change

Decreased

Reason for change

Increase in revenue was greater than increase in emissions, resulting in a lower intensity.

Intensity figure

0.85

Metric numerator (Gross global combined Scope 1 and 2 emissions)

29,480,129

Metric denominator

megawatt hour generated (MWh)

Metric denominator: Unit total

34,546,832

Scope 2 figure used

Location-based

% change from previous year

2.3

Direction of change

Decreased

Reason for change

Increase in generation was greater than increase in emissions due to more efficient generation, resulting in lower intensity.

C7. Emissions breakdowns

C7.1

(C7.1) Does your organization break down its Scope 1 emissions by greenhouse gas type?

Yes

C7.1a

(C7.1a) Break down your total gross global Scope 1 emissions by greenhouse gas type and provide the source of each used greenhouse warming potential (GWP).

Greenhouse gas	Scope 1 emissions (metric tons of CO ₂ e)	GWP Reference
CO ₂	29,265,151	IPCC Fourth Assessment Report (AR4 - 100 year)
CH ₄	79,474	IPCC Fourth Assessment Report (AR4 - 100 year)
N ₂ O	137,103	IPCC Fourth Assessment Report (AR4 - 100 year)

C-EU7.1b

(C-EU7.1b) Break down your total gross global Scope 1 emissions from electric utilities value chain activities by greenhouse gas type.

	Gross Scope 1 CO ₂ emissions (metric tons CO ₂)	Gross Scope 1 methane emissions (metric tons CH ₄)	Gross Scope 1 SF ₆ emissions (metric tons SF ₆)	Gross Scope 1 emissions (metric tons CO ₂ e)	Comment
Fugitives	0	29,040	49,513	78,553	Scope 1 Gas Operations and Scope 1 (Electric Substation and Distribution SF ₆)
Combustion (Electric utilities)	29,265,151	79,474	0	29,481,728	Scope 1 Gross MWh, Small Plant Stationary
Combustion (Gas utilities)	0	0	0	0	
Combustion (Other)	0	0.4	0	0.4	
Emissions not elsewhere classified	0	0	0	49,715	Plant Mobile Equipment and Fleet Vehicles

C7.2

(C7.2) Break down your total gross global Scope 1 emissions by country/region.

Country/Region	Scope 1 emissions (metric tons CO ₂ e)
United States of America	29,577,605

United Kingdom of Great Britain and Northern Ireland	31,889
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C7.3

(C7.3) Indicate which gross global Scope 1 emissions breakdowns you are able to provide.

By business division

C7.3a

(C7.3a) Break down your total gross global Scope 1 emissions by business division.

Business division	Scope 1 emissions (metric ton CO2e)
LGE and KU	29,552,943
PPL EU	24,662
WPD	31,889

C-CE7.4/C-CH7.4/C-CO7.4/C-EU7.4/C-MM7.4/C-OG7.4/C-ST7.4/C-TO7.4/C-TS7.4

(C-CE7.4/C-CH7.4/C-CO7.4/C-EU7.4/C-MM7.4/C-OG7.4/C-ST7.4/C-TO7.4/C-TS7.4) Break down your organization’s total gross global Scope 1 emissions by sector production activity in metric tons CO2e.

	Gross Scope 1 emissions, metric tons CO2e	Comment
Electric utility generation activities	29,501,696	Gross Scope 1: emissions associated with gross MWh’s (includes CO2, N2O and CH4), emissions from small plant stationary fuel combustion sources not included in stack emissions, and emissions from plant mobile equipment and LGE and KU fleet vehicles.

C7.5

(C7.5) Break down your total gross global Scope 2 emissions by country/region.

Country/Region	Scope 2, location-based (metric tons CO2e)	Scope 2, market-based (metric tons CO2e)	Purchased and consumed electricity, heat, steam or cooling (MWh)	Purchased and consumed low-carbon electricity, heat, steam or cooling accounted in market-based approach (MWh)
United States of America	238,075	27,188	207,203	0

United Kingdom of Great Britain and Northern Ireland	0	7,853	22,388	0
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C7.6

(C7.6) Indicate which gross global Scope 2 emissions breakdowns you are able to provide.

By business division

C7.6a

(C7.6a) Break down your total gross global Scope 2 emissions by business division.

Business division	Scope 2, location-based emissions (metric tons CO2e)	Scope 2, market-based emissions (metric tons CO2e)
LGE and KU	238,075	3,124
PPL EU	0	24,064
WPD	0	7,853

C7.9

(C7.9) How do your gross global emissions (Scope 1 and 2 combined) for the reporting year compare to those of the previous reporting year?

Increased

C7.9a

(C7.9a) Identify the reasons for any change in your gross global emissions (Scope 1 and 2 combined) and for each of them specify how your emissions compare to the previous year.

	Change in emissions (metric tons CO2e)	Direction of change	Emissions value (percentage)	Please explain calculation
Change in renewable energy consumption				
Other emissions reduction activities				
Divestment				
Acquisitions				

Mergers				
Change in output	801,372	Increased	2.75	Emissions increased 801,372 metric tons CO2e between 2017 (29,145,624) and 2018: (29,946,996). This reflects a 2.75% increase over 2017 emissions for electric and gas operations.
Change in methodology				
Change in boundary				
Change in physical operating conditions				
Unidentified				
Other				

C7.9b

(C7.9b) Are your emissions performance calculations in C7.9 and C7.9a based on a location-based Scope 2 emissions figure or a market-based Scope 2 emissions figure?

Market-based

C8. Energy

C8.1

(C8.1) What percentage of your total operational spend in the reporting year was on energy?

More than 0% but less than or equal to 5%

C8.2

(C8.2) Select which energy-related activities your organization has undertaken.

	Indicate whether your organization undertakes this energy-related activity
Consumption of fuel (excluding feedstocks)	Yes
Consumption of purchased or acquired electricity	Yes

Consumption of purchased or acquired heat	No
Consumption of purchased or acquired steam	No
Consumption of purchased or acquired cooling	No
Generation of electricity, heat, steam, or cooling	Yes

C8.2a

(C8.2a) Report your organization’s energy consumption totals (excluding feedstocks) in MWh.

	Heating value	MWh from renewable sources	MWh from non-renewable sources	Total MWh
Consumption of fuel (excluding feedstock)	HHV (higher heating value)	0	324,059	324,059
Consumption of purchased or acquired electricity		34,661.9	112,212	146,873.9
Consumption of self-generated non-fuel renewable energy		2,684		2,684
Total energy consumption		37,345.9	436,271	473,616.9

C8.2b

(C8.2b) Select the applications of your organization’s consumption of fuel.

	Indicate whether your organization undertakes this fuel application
Consumption of fuel for the generation of electricity	Yes
Consumption of fuel for the generation of heat	Yes
Consumption of fuel for the generation of steam	No
Consumption of fuel for the generation of cooling	No
Consumption of fuel for co-generation or tri-generation	No

C8.2c

(C8.2c) State how much fuel in MWh your organization has consumed (excluding feedstocks) by fuel type.

Fuels (excluding feedstocks)

Natural Gas

Heating value

HHV (higher heating value)

Total fuel MWh consumed by the organization

110,712.8

MWh fuel consumed for self-generation of electricity

0

MWh fuel consumed for self-generation of heat

0

Comment

Calculated for combined cycle plant.

Fuels (excluding feedstocks)

Diesel

Heating value

HHV (higher heating value)

Total fuel MWh consumed by the organization

157,198.98

MWh fuel consumed for self-generation of electricity

0

MWh fuel consumed for self-generation of heat

0

Comment

EPA conversion factors used to calculate Diesel.

Fuels (excluding feedstocks)

Petrol

Heating value

HHV (higher heating value)

Total fuel MWh consumed by the organization

49,599.94

MWh fuel consumed for self-generation of electricity

0

MWh fuel consumed for self-generation of heat

0

Comment

EPA conversion factors used to calculate Petrol.

Fuels (excluding feedstocks)

Jet Gasoline

Heating value

HHV (higher heating value)

Total fuel MWh consumed by the organization

6,547

MWh fuel consumed for self-generation of electricity

0

MWh fuel consumed for self-generation of heat

0

Comment

WPD's helicopter fleet

C8.2d

(C8.2d) List the average emission factors of the fuels reported in C8.2c.

Diesel

Emission factor

10.21

Unit

kg CO2e per gallon

Emission factor source

EPA Emission Factor (Reference)

Defra

Comment

Diesel= 10.21 kg CO2e/gal

Jet Gasoline

Emission factor

2.53883

Unit

kg CO₂e per liter

Emission factor source

Defra (2018 data)

Comment

Jet Gasoline= 2.53883 kg CO₂e/liter

Natural Gas

Emission factor

1.065

Unit

lb CO₂e per million Btu

Emission factor source

EPA Emission Factor (Reference)
Defra

Comment

LGE and KU: Combined emission factor for following:

0.001 kg CH₄/mmBtu with GWP of 25

0.001 kg N₂O/mmBTU with GWP of 298

Petrol

Emission factor

8.78

Unit

kg CO₂e per gallon

Emission factor source

EPA Emission Factor (Reference)

Comment

Gasoline= 8.78 kg CO₂e/gal

C8.2e

(C8.2e) Provide details on the electricity, heat, steam, and cooling your organization has generated and consumed in the reporting year.

	Total Gross generation (MWh)	Generation that is consumed by the organization (MWh)	Gross generation from renewable sources (MWh)	Generation from renewable sources that is consumed by the organization (MWh)
Electricity	36,682,634	2,135,802	363,262	2,684
Heat	0	0	0	0
Steam	0	0	0	0
Cooling	0	0	0	0

C-EU8.2e

(C-EU8.2e) For your electric utility activities, provide a breakdown of your total power plant capacity, generation, and related emissions during the reporting year by source.

Coal – hard

Nameplate capacity (MW)

5,754

Gross electricity generation (GWh)

29,869.82

Net electricity generation (GWh)

27,883.08

Absolute scope 1 emissions (metric tons CO2e)

26,729,640

Scope 1 emissions intensity (metric tons CO2e per GWh)

958.63

Comment

Total CO2e associated with gross generation divided by net generation. Net generation data excludes purchased power.

Lignite

Nameplate capacity (MW)

0

Gross electricity generation (GWh)

0

Net electricity generation (GWh)

0

Absolute scope 1 emissions (metric tons CO2e)

0

Scope 1 emissions intensity (metric tons CO₂e per GWh)

0

Comment

Oil

Nameplate capacity (MW)

0

Gross electricity generation (GWh)

0

Net electricity generation (GWh)

0

Absolute scope 1 emissions (metric tons CO₂e)

0

Scope 1 emissions intensity (metric tons CO₂e per GWh)

0

Comment

Gas

Nameplate capacity (MW)

3,285

Gross electricity generation (GWh)

6,447.16

Net electricity generation (GWh)

6,301.11

Absolute scope 1 emissions (metric tons CO₂e)

2,750,813

Scope 1 emissions intensity (metric tons CO₂e per GWh)

436.56

Comment

Biomass

Nameplate capacity (MW)

0

Gross electricity generation (GWh)

0

Net electricity generation (GWh)

0

Absolute scope 1 emissions (metric tons CO₂e)

0

Scope 1 emissions intensity (metric tons CO₂e per GWh)

0

Comment

Waste (non-biomass)

Nameplate capacity (MW)

0

Gross electricity generation (GWh)

0

Net electricity generation (GWh)

0

Absolute scope 1 emissions (metric tons CO₂e)

0

Scope 1 emissions intensity (metric tons CO₂e per GWh)

0

Comment

Nuclear

Nameplate capacity (MW)

0

Gross electricity generation (GWh)

0

Net electricity generation (GWh)

0

Absolute scope 1 emissions (metric tons CO₂e)

0

Scope 1 emissions intensity (metric tons CO₂e per GWh)

0

Comment

Geothermal

Nameplate capacity (MW)

0

Gross electricity generation (GWh)

0

Net electricity generation (GWh)

0

Absolute scope 1 emissions (metric tons CO₂e)

0

Scope 1 emissions intensity (metric tons CO₂e per GWh)

0

Comment

Hydroelectric

Nameplate capacity (MW)

134

Gross electricity generation (GWh)

346.23

Net electricity generation (GWh)

343.55

Absolute scope 1 emissions (metric tons CO₂e)

0

Scope 1 emissions intensity (metric tons CO₂e per GWh)

0

Comment

Wind

Nameplate capacity (MW)

0

Gross electricity generation (GWh)

0

Net electricity generation (GWh)

0

Absolute scope 1 emissions (metric tons CO₂e)

0

Scope 1 emissions intensity (metric tons CO₂e per GWh)

0

Comment

Solar

Nameplate capacity (MW)

10

Gross electricity generation (GWh)

17.03

Net electricity generation (GWh)

17.03

Absolute scope 1 emissions (metric tons CO₂e)

0

Scope 1 emissions intensity (metric tons CO₂e per GWh)

0

Comment

Other renewable

Nameplate capacity (MW)

0

Gross electricity generation (GWh)

0

Net electricity generation (GWh)

0

Absolute scope 1 emissions (metric tons CO₂e)

0

Scope 1 emissions intensity (metric tons CO₂e per GWh)

0

Comment

Other non-renewable

Nameplate capacity (MW)

0

Gross electricity generation (GWh)

2.39

Net electricity generation (GWh)

2.06

Absolute scope 1 emissions (metric tons CO2e)

Scope 1 emissions intensity (metric tons CO2e per GWh)

Comment

Petroleum - Scope 1 CO2e is captured in the coal number above.

Total

Nameplate capacity (MW)

9,183

Gross electricity generation (GWh)

36,682.63

Net electricity generation (GWh)

34,546.83

Absolute scope 1 emissions (metric tons CO2e)

29,480,452

Scope 1 emissions intensity (metric tons CO2e per GWh)

853.35

Comment

C8.2f

(C8.2f) Provide details on the electricity, heat, steam and/or cooling amounts that were accounted for at a low-carbon emission factor in the market-based Scope 2 figure reported in C6.3.

Basis for applying a low-carbon emission factor

No purchases or generation of low-carbon electricity, heat, steam or cooling accounted with a low-carbon emission factor

Low-carbon technology type

Region of consumption of low-carbon electricity, heat, steam or cooling

MWh consumed associated with low-carbon electricity, heat, steam or cooling

Emission factor (in units of metric tons CO₂e per MWh)

Comment

C-EU8.4

(C-EU8.4) Does your electric utility organization have a transmission and distribution business?

Yes

C-EU8.4a

(C-EU8.4a) Disclose the following information about your transmission and distribution business.

Country/Region

United States of America

Voltage level

Transmission (high voltage)

Annual load (GWh)

40,046.8

Scope 2 emissions (basis)

Market-based

Scope 2 emissions (metric tons CO₂e)

0

Annual energy losses (% of annual load)

5

Length of network (km)

28,184

Number of connections

135

Area covered (km²)

50,246

Comment

Defined as voltage exceeding 69 kV.

Transmission is Scope 1 for LKE and Scope 3 for PPL EU.

Country/Region

United States of America

Voltage level

Distribution (low voltage)

Annual load (GWh)

69,060.4

Scope 2 emissions (basis)

Market-based

Scope 2 emissions (metric tons CO₂e)

0

Annual energy losses (% of annual load)

5

Length of network (km)

153,763

Number of connections

2,409,436

Area covered (km²)

50,246

Comment

Defined as voltage not exceeding 69 kV.

Distribution is Scope 1 for LKE and Scope 3 for PPL EU.

Country/Region

United States of America

Voltage level

Transmission (high voltage)

Annual load (GWh)

273.8

Scope 2 emissions (basis)

Location-based

Scope 2 emissions (metric tons CO₂e)

241,199

Annual energy losses (% of annual load)

5

Length of network (km)

28,184

Number of connections

11

Area covered (km²)

50,246

Comment

Defined as voltage exceeding 69 kV.

Transmission is Scope 1 for LKE and Scope 3 for PPL EU.

Country/Region

United Kingdom of Great Britain and Northern Ireland

Voltage level

Distribution (low voltage)

Annual load (GWh)

74,499.4

Scope 2 emissions (basis)

Market-based

Scope 2 emissions (metric tons CO₂e)

0

Annual energy losses (% of annual load)

5.3

Length of network (km)

224,913

Number of connections

7,875,322

Area covered (km²)

55,500

Comment

Defined as voltage not exceeding 132kV.

Number of connections are the total of end use customers.

Distribution is Scope 3 for WPD.

C9. Additional metrics

C9.1

(C9.1) Provide any additional climate-related metrics relevant to your business.

C-EU9.5a

(C-EU9.5a) Break down, by source, your total planned CAPEX in your current CAPEX plan for power generation.

Primary power generation source	CAPEX planned for power generation from this source	Percentage of total CAPEX planned for power generation	End year of CAPEX plan	Comment
Solar	100,000,000	100	2019	Percentage is for Safari Energy alone. Safari Energy is planning to design, engineer, install, own and operate solar facilities at customer facilities across the United States.
Coal – hard	1,036,584,612	84.93	2023	Percentage is for LGE and KU alone and covers LGE and KU 2019 - 2023 CAPEX
Gas	168,346,387	13.79	2023	Percentage is for LGE and KU alone and covers LGE and KU 2019 - 2023 CAPEX
Hydroelectric	9,246,994	0.76	2023	Percentage is for LGE and KU alone and covers LGE and KU 2019 - 2023 CAPEX
Solar	6,372,000	0.52	2023	Percentage is for LGE and KU alone and covers LGE and KU 2019 - 2023 CAPEX: Design, Engineering, Construction of solar facilities for the Companies' subscription-based Solar Share program (Solar facilities expected to be built based on customer demand, for utilities' residential and business customers)

				interested in receiving solar energy credits generated from the facility).
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C-EU9.5b

(C-EU9.5b) Break down your total planned CAPEX in your current CAPEX plan for products and services (e.g. smart grids, digitalization, etc.).

Products and services	Description of product/service	CAPEX planned for product/service	Percentage of total CAPEX planned products and services	End of year CAPEX plan
Smart grid	LGE and KU: Transmission Control House Replacements, Electro-Mechanical Relay Replacements, Switch Installations and Replacements, Distribution Automation, Fuse Savings Pilot, SCADA Expansion, Advanced Metering Systems Opt In (DSM)	156,241,000	1.21	2023
Smart grid	WPD: Innovation Projects to explore Low Carbon technologies and assist networks to enable the increased adoption of renewables, electric vehicles, heat pumps, energy storage and demand side management	57,338,600	0.45	2023
Other, please specify Heat pumps	WPD: Reinforcement of network for heat pumps	6,485,600	0.05	2023
Charging networks	WPD Reinforcement of network for electric charging points	72,547,600	0.56	2023
Other, please specify Solar/Photovoltaic	WPD: Reinforcement of network for photovoltaic	41,620,400	0.32	2023
Distributed generation	WPD: Reinforcement of network for distributed generation and DG Connections	360,781,600	2.8	2023
Other, please specify Keystone Solar Future Project	PPL EU is working with multiple research partners on the Keystone Solar Future Project. PPL EU will design, build and pilot new tools to integrate distributed energy sources –	1,878,811	0.01	2023

	such as rooftop solar panels – into its grid.			
Distributed generation	PPL EU: Reinforcement of network for distributed generation projects.	5,966,000	0.05	2023
Smart grid	PPL EU: Investments in smart grid technology include pole-top sensors that detect outages, battery and transformer monitoring equipment, technology that quickly analyzes the location of faults and remote-operable switches that quickly reroute or restore power. The utility has also invested in new substations and is rebuilding miles of transmission lines to strengthen grid resiliency.	34,744,151	0.27	2023
Other, please specify Battery	PPL EU: Investments in battery storage.	1,850,000	0.01	2023
Other, please specify Smart meter	PPL EU is currently working on a meter replacement project, which enables better management of power usage, more accurate outage reporting and new functionality that improves customer service.	93,974,603	0.73	2023
Other, please specify Remanufactured furniture	PPL EU's Our furniture manufacturer has significantly reduced the amount of waste and CO2 in their production product.	1,300,000	0.01	2023
Other, please specify Service center solar panels	PPL EU: Investment in solar panels for its Quarryville and Lancaster Service Centers.	722,000	0.01	2023
Other, please specify Building energy efficiency	PPL EU: Energy efficiency components of facilities projects.	20,000,000	0.16	2023
Other, please specify SF6 controls	PPL EU: development of controls to reduce SF6 emissions.	152,620,000	1.18	2023
Other, please specify	PPL EU: investment in motor operated load break air breaks to reduce drive time.	126,800,000	0.98	2023

Motor operated load break air break				
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C-CO9.6/C-EU9.6/C-OG9.6

(C-CO9.6/C-EU9.6/C-OG9.6) Disclose your investments in low-carbon research and development (R&D), equipment, products, and services.

Investment start date

January 1, 2018

Investment end date

December 31, 2018

Investment area

R&D

Technology area

Energy storage

Investment maturity

Pilot demonstration

Investment figure

600,000

Low-carbon investment percentage

0-20%

Please explain

LGE and KU Battery Storage Demonstration: For Direct Cost and Labor Cost; not inclusive of equipment cost of \$2M purchased in 2017.

Investment start date

January 1, 2018

Investment end date

December 31, 2018

Investment area

R&D

Technology area

Distributed energy resources

Investment maturity

Pilot demonstration

Investment figure

2,200,000

Low-carbon investment percentage

0-20%

Please explain

PPL EU Keystone Solar Project: A U.S. D.O.E. grant project focused on improving distributed energy resource (DER) integration into PPL EU's distribution grid. Broken down into three phases: 1) development of a DER customer portal, 2) development of a Distributed Energy Resource Management System (DERMS), and 3) technology demonstration.

Investment start date

October 1, 2018

Investment end date

October 1, 2019

Investment area

R&D

Technology area

Other, please specify
Energy curtailment and dispatch model

Investment maturity

Applied research and development

Investment figure

107,368.3

Low-carbon investment percentage

0-20%

Please explain

WPD CADET (Curtailment and Dispatch Estimation Toolkit): The main objective of this project will be the development of customer behavior models for all types of demand, generation and storage that can be used as an input to the Energy Curtailment (and/or dispatch) Estimation techniques that WPD is developing.

Investment start date

April 1, 2016

Investment end date

October 1, 2019

Investment area

R&D

Technology area

Demand side response programs

Investment maturity

Applied research and development

Investment figure

2,095,546.08

Low-carbon investment percentage

0-20%

Please explain

WPD Electric Nation: To enable Distribution Network Operators (DNOs) to identify which parts of their network are likely to be affected by uptake of Plug in Vehicles (PIV) and whether demand control (optimizing the timing of charging PIV) is a cost-effective solution to avoiding or deferring reinforcement on vulnerable parts of their network. This project began in 2016. The stated investment is limited to the investment made in 2018.

Investment start date

April 1, 2018

Investment end date

December 1, 2018

Investment area

R&D

Technology area

Other, please specify
Low-carbon products

Investment maturity

Applied research and development

Investment figure

164,306.73

Low-carbon investment percentage

0-20%

Please explain

WPD Carbon Portal: Follow on project from Carbon Tracing - which tested the levels of interest that customers have in how their energy is made up i.e. the mix of solar, wind or fossil fuels, and involved the development of an app and website to provide visibility to customers of the generation mix.

This project is continuing the successful Carbon Tracer app development to cover external data access and implement enhancements and changes according to customer feedback on the existing Carbon Tracer app.

Investment start date

November 1, 2017

Investment end date

January 1, 2019

Investment area

R&D

Technology area

Smart grids

Investment maturity

Pilot demonstration

Investment figure

142,492.12

Low-carbon investment percentage

0-20%

Please explain

WPD Assessment and Testing of Alternative Cut-outs: Collaborative project led by UKPN. This project is looking at alternative cut-out equipment used by network operators outside the U.K. and assess the suitability of these as a potential replacement for existing equipment.

This will facilitate additional load capability for Low Carbon Technologies such as Electric Vehicles and Heat Pumps.

Investment start date

October 1, 2017

Investment end date

October 1, 2018

Investment area

R&D

Technology area

Smart grids

Investment maturity

Basic academic/theoretical research

Investment figure

103,490.52

Low-carbon investment percentage

0-20%

Please explain

WPD DEDUCE (Determining Electricity Distribution Usage with Consumer Electronics): This project looks to develop a low cost (sub £100) distribution substation monitor based on indirect loading measures (temperature, noise, vibration...). At a minimum this must give access to more granular and less error prone data than is currently acquired.

This will provide additional data to increase the utilization of the network to connect additional Distributed Generation and Low Carbon Technologies

Investment start date

September 1, 2018

Investment end date

December 1, 2020

Investment area

R&D

Technology area

Smart grids

Investment maturity

Applied research and development

Investment figure

796,638.52

Low-carbon investment percentage

0-20%

Please explain

WPD EDGE-FCLi (Embedded Distributed Generation Electronic Fault Current Limiting interrupter): This project will investigate the integration of FCLi technology into the WPD network at the point of common coupling of a synchronous distributed generation plant and assess the extent to which the fault infeed from the Generator can indeed be limited and then interrupted. The stated investment is limited to the investment made in 2018.

Investment start date

June 1, 2016

Investment end date

April 1, 2019

Investment area

R&D

Technology area

Demand side response programs

Investment maturity

Small scale commercial deployment

Investment figure

309,667.46

Low-carbon investment percentage

0-20%

Please explain

WPD Entire: To identify and address the key commercial challenges that a Distribution Network Operator will be presented with when developing mechanisms for demand side response. This might include developing new systems to provide visibility of capacity and establishing contracts with commercial customers. This project began in 2016. The stated investment is limited to the investment made in 2018.

Investment start date

October 1, 2016

Investment end date

January 1, 2019

Investment area

R&D

Technology area

Other, please specify
Hybrid heating systems with heat pumps

Investment maturity

Applied research and development

Investment figure

54,709.36

Low-carbon investment percentage

0-20%

Please explain

WPD FREEDOM (Flexible Residential Energy Efficiency Demand Optimization and Management): To investigate the feasibility of the use of heat pumps on our networks. The project will investigate technical capabilities and whether hybrid heating systems are affordable and attractive to customers as a way of heating homes. This project began in 2016. The stated investment is limited to the investment made in 2018.

Investment start date

May 1, 2018

Investment end date

January 1, 2019

Investment area

R&D

Technology area

Other, please specify
Hydrogen as fuel for fleet vehicles

Investment maturity

Applied research and development

Investment figure

58,314.37

Low-carbon investment percentage

0-20%

Please explain

WPD Hydrogen Heat and Fleet Viability Assessment: This project is a feasibility study with the aim to research the use of hydrogen for vehicles and as a fuel for combined heat and power.

Investment start date

August 1, 2016

Investment end date

April 1, 2018

Investment area

R&D

Technology area

Energy storage

Investment maturity

Applied research and development

Investment figure

60,781.33

Low-carbon investment percentage

0-20%

Please explain

WPD Industrial and Commercial Storage: This project will test multiple configurations of battery energy storage to assess the potential for improvements in cost efficiency, customer service and reliability of the network. This project began in 2016. The stated investment is limited to the investment made in 2018.

Investment start date

April 1, 2016

Investment end date

April 1, 2019

Investment area

R&D

Technology area

Demand side response programs

Investment maturity

Pilot demonstration

Investment figure

265,152.22

Low-carbon investment percentage

0-20%

Please explain

WPD LV Connect and Manage: To demonstrate and prove that Active Network Management can be used on the low voltage network as a short-term measure to allow new connections whilst network reinforcement takes place. Active Network Management requires the deployment of communication and control infrastructure to allow Low Carbon Technologies to be managed remotely. This project began in 2016. The stated investment is limited to the investment made in 2018.

Investment start date

October 1, 2018

Investment end date

February 1, 2019

Investment area

R&D

Technology area

Digital technology

Investment maturity

Applied research and development

Investment figure

420,063.75

Low-carbon investment percentage

0-20%

Please explain

WPD LCT Detection: This project will take industry data and apply leading-edge cognitive analytics to provide WPD with improved visibility of electric vehicles and DER, to support forecasting of the proliferation of PV/EV across networks and other DER connections to support network planning including the options of active/flexible network management.

Investment start date

April 1, 2015

Investment end date

May 1, 2019

Investment area

R&D

Technology area

Smart grids

Investment maturity

Applied research and development

Investment figure

365,692.93

Low-carbon investment percentage

0-20%

Please explain

WPD Losses Investigation: Understanding technical losses on the low voltage and high voltage distribution network and determining the minimum information required to accurately predict network losses. This project began in 2015. The stated investment is limited to the investment made in 2018.

Investment start date

August 1, 2016

Investment end date

August 1, 2018

Investment area

R&D

Technology area

Infrastructure

Investment maturity

Basic academic/theoretical research

Investment figure

12,973.73

Low-carbon investment percentage

0-20%

Please explain

WPD Next Generation Wireless Telecoms Analysis: The project seeks to establish a radio network design for the WPD license areas of West Midlands and South West, aligned to the existing infrastructure both active and passive, and in so doing minimize the likely investment. This design will provide for an enhanced operational communications capability to serve future initiatives such as Active Network Management whilst also enabling the anticipated increase in embedded generation on the network.

Investment start date

December 1, 2018

Investment end date

December 1, 2021

Investment area

R&D

Technology area

Smart grids

Investment maturity

Pilot demonstration

Investment figure

72,393.31

Low-carbon investment percentage

0-20%

Please explain

WPD OHL Power Pointer: This project will trial a device that is capable of self-powering operation to provide real-time voltage, current and power flow information. This information will be used to more accurately assess network operation, such as latent generation output and directional fault detection to more quickly identify the location of faults. This project continues until 2021. The stated investment is limited to investment in 2018 – 2019.

Investment start date

February 1, 2018

Investment end date

April 1, 2020

Investment area

R&D

Technology area

Demand side response programs

Investment maturity

Small scale commercial deployment

Investment figure

71,347.4

Low-carbon investment percentage

0-20%

Please explain

WPD Visibility Plugs and Socket: This project seeks to investigate the use of a market platform to procure and dispatch flexibility services. The process of designing, building and testing the market platform will provide learning that will inform the way flexibility markets operate, DNOs procure services and data is exchanged between interested parties. This project continues until 2020. The stated investment is limited to investment in 2018-2019.

Investment start date

March 1, 2018

Investment end date

March 1, 2021

Investment area

R&D

Technology area

Smart grids

Investment maturity

Pilot demonstration

Investment figure

268,237.26

Low-carbon investment percentage

0-20%

Please explain

WPD Primary Networks Power Quality Analysis: This project will build on existing best practice and evaluate how harmonics and power quality can be monitored and analyzed in a cost-effective way across wide areas of the network.

Understanding of network power quality will enable understanding of the needs of the network related to increased power electronic-based Low Carbon Technologies connect.

Investment start date

January 1, 2018

Investment end date

December 1, 2019

Investment area

R&D

Technology area

Demand side response programs

Investment maturity

Applied research and development

Investment figure

345,708.52

Low-carbon investment percentage

0-20%

Please explain

WPD Smart Energy Isles: The project is looking to enable low voltage distributed generation on the Isles of Scilly to connect into the existing active network management system while enabling the local demand side response to reduce curtailment for those generators.

Investment start date

May 1, 2017

Investment end date

May 1, 2019

Investment area

R&D

Technology area

Other, please specify
SF6 replacement

Investment maturity

Applied research and development

Investment figure

35,912.07

Low-carbon investment percentage

0-20%

Please explain

WPD SF6 Alternatives: The aim of this project is to evaluate alternative insulating medium in place of sulphur hexafluoride (SF6), an extremely potent greenhouse gas. This project began in 2017. The stated investment is limited to investment in 2018 – 2019.

Investment start date

April 1, 2015

Investment end date

January 1, 2019

Investment area

R&D

Technology area

Energy storage

Investment maturity

Applied research and development

Investment figure

8,436.48

Low-carbon investment percentage

0-20%

Please explain

WPD Solar Storage: To investigate the technical and commercial feasibility of battery storage embedded within distributed generation installations. This project began in 2015. The stated investment is limited to investment in 2018.

Investment start date

December 1, 2018

Investment end date

August 1, 2020

Investment area

R&D

Technology area

Demand side response programs

Investment maturity

Applied research and development

Investment figure

35,263.57

Low-carbon investment percentage

0-20%

Please explain

WPD Virtual Statcom: During this project, power system studies will be performed to determine whether it is possible to improve the network voltages and release network capacity by controlling the power factor of generators already connected to the 11kV and 33kV network.

This will facilitate voltage control to create additional network connection capacity, including for low-carbon technologies.

Investment start date

July 1, 2015

Investment end date

July 1, 2018

Investment area

R&D

Technology area

Infrastructure

Investment maturity

Pilot demonstration

Investment figure

40,914.41

Low-carbon investment percentage

0-20%

Please explain

WPD Improved Statistical Ratings for Distribution Overhead Lines: Collaborative Energy Networks Association (ENA) Project registered by WPD. Development of software tool to optimize regional and line specific ratings.

This will allow increased network loading capability for low carbon loads

Investment start date

December 1, 2016

Investment end date

April 1, 2020

Investment area

R&D

Technology area

Digital technology

Investment maturity

Pilot demonstration

Investment figure

1,831,542.69

Low-carbon investment percentage

0-20%

Please explain

WPD OpenLV: The OpenLV project will trial and demonstrate an open, flexible platform that could ultimately be deployed to every low voltage substation in Great Britain. Through three key methods, the project will demonstrate the platform's ability to provide benefits to the network, customers, commercial entities and research organizations. This project began in 2016. The stated investment is limited to investment in 2018 – 2019.

Investment start date

September 1, 2018

Investment end date

October 1, 2021

Investment area

R&D

Technology area

Demand side response programs

Investment maturity

Pilot demonstration

Investment figure

921,916.1

Low-carbon investment percentage

0-20%

Please explain

WPD EFFS: The project will deliver a practical robust and accurate system capability that will enable a DNO to actively manage the provision of flexibility services necessary for transition to becoming a DSO.

Having specified requirements, the project will consider the technical options for delivering the required functionality. The selected technical option will then be built to support a short trial, to demonstrate that the software can support the functionality specified.

This will enable maximization of network utilization at lowest cost, thereby encouraging low carbon technologies to connect to the grid.

Investment start date

March 1, 2015

Investment end date

June 1, 2019

Investment area

R&D

Technology area

Smart grids

Investment maturity

Pilot demonstration

Investment figure

2,620,384.67

Low-carbon investment percentage

0-20%

Please explain

WPD Network Equilibrium: Network Equilibrium will successfully demonstrate centralized voltage optimization in 33kV and 11kV networks through the design, implementation and trial of the System Voltage Optimization technology. Intelligent power flow control will be implemented through the operation of the Flexible Power Link, which allows power transfers between two grid groups that could not be traditionally interconnected. This project began in 2015. The stated investment is limited to investment in 2018 – 2019.

C10. Verification

C10.1

(C10.1) Indicate the verification/assurance status that applies to your reported emissions.

	Verification/assurance status
Scope 1	No third-party verification or assurance
Scope 2 (location-based or market-based)	No third-party verification or assurance
Scope 3	No third-party verification or assurance

C10.2

(C10.2) Do you verify any climate-related information reported in your CDP disclosure other than the emissions figures reported in C6.1, C6.3, and C6.5?

No, but we are actively considering verifying within the next two years

C11. Carbon pricing

C11.1

(C11.1) Are any of your operations or activities regulated by a carbon pricing system (i.e. ETS, Cap & Trade or Carbon Tax)?

Yes

C11.1a

(C11.1a) Select the carbon pricing regulation(s) which impacts your operations.

UK carbon price floor

C11.1c

(C11.1c) Complete the following table for each of the tax systems in which you participate.

UK carbon price floor

Period start date

January 1, 2018

Period end date

December 31, 2018

% of emissions covered by tax

100

Total cost of tax paid

140,623.62

Comment

The U.K. Carbon Price Floor (CRC Energy Efficiency Scheme) apply to WPD's Scope 2 emissions (building energy use), not Scope 1 emissions. Under these requirements, WPD must purchase carbon allowances to offset emissions associated with its building energy use. The relevant compliance period under this scheme ran from 01/04/2015 to 31/03/2019. WPD must purchase allowances for each regulatory compliance year which runs from April 1 to March 31. We calculate the number of allowances for 2018 by pro-rating data from the 2017/18 allowances to cover the January 2018 – March 2018 period, and then adding the portion of the 2018/19 allowances based on our building energy use April 1, 2018 – December 31, 2018.

C11.1d

(C11.1d) What is your strategy for complying with the systems in which you participate or anticipate participating?

WPD's strategy for compliance with the U.K. Carbon Price Floor (CRC Energy Efficiency Scheme) was to purchase carbon allowances to offset emissions associated with its building energy use. The relevant compliance period under this scheme ran from 01/04/2015 to 31/03/2019. WPD was required to report on emissions associated with its building energy use and to purchase allowances to offset those emissions for each regulatory compliance year which ran from April 1 to March 31.

C11.2

(C11.2) Has your organization originated or purchased any project-based carbon credits within the reporting period?

No

C11.3

(C11.3) Does your organization use an internal price on carbon?

Yes

C11.3a

(C11.3a) Provide details of how your organization uses an internal price on carbon.

Objective for implementing an internal carbon price

Other, please specify

Other, please specify If other, please specify: Used in LGE and KU's integrated resources planning process

GHG Scope

Scope 1

Application

Applicable to LGE and KU operating companies.

Actual price(s) used (Currency /metric ton)

17

Variance of price(s) used

LGE and KU's IRP process reflects a carbon price of \$17 - \$26 per ton

Type of internal carbon price

Shadow price

Impact & implication

Internal carbon price is part of overall financial analysis and resource planning guiding investment decisions. For example, based on these analyses, LGE and KU invested in combined cycle gas generation.

C12. Engagement

C12.1

(C12.1) Do you engage with your value chain on climate-related issues?

Yes, our suppliers

Yes, our customers

C12.1a

(C12.1a) Provide details of your climate-related supplier engagement strategy.

Type of engagement

Compliance & onboarding

Details of engagement

Other, please specify

Suppliers must meet 13.7% renewables

% of suppliers by number

% total procurement spend (direct and indirect)

% Scope 3 emissions as reported in C6.5

0

Rationale for the coverage of your engagement

Every energy supplier to PPL EU is required to fulfill their portion of the Alternative Energy Portfolio Standards obligation.

Impact of engagement, including measures of success

Success is measured by confirming that the total number of credits transferred through the PJM electronic transfer system is commensurate with PPL EU's Alternative Energy Portfolio Standards obligation.

Comment

In 2018 PPL EU requires energy suppliers to provide 13.7% renewable and alternative energy to meet annual Alternative Energy Portfolio Standards. This will increase 1/2 percent each year.

Percentage of suppliers and spend are not publicly disclosed.

C12.1b

(C12.1b) Give details of your climate-related engagement strategy with your customers.

Type of engagement

Education/information sharing

Details of engagement

Share information about your products and relevant certification schemes (i.e. Energy STAR)

% of customers by number

32

% Scope 3 emissions as reported in C6.5

0

Please explain the rationale for selecting this group of customers and scope of engagement

Stated percentage is for U.S. customers only and does not include WPD. PPL’s operating companies engage customers through a variety of rebate programs, energy efficiency workshops, video and social media profiles highlighting customers’ energy savings and in-school curricula that teach students the importance of energy, natural resources and environmental issues. In addition to direct customer engagement programs, the companies also conduct community outreach programs such as tree planting programs, sponsorships of environmental programs with community partners and collaboration with industry and academic partners. Engagement across all levels of customer class – from residential to industrial – ensures all customers have the information they need regarding energy efficiency, PPL’s carbon goals and how we can help customers achieve their own sustainability goals.

Impact of engagement, including measures of success

For customers engaged in formal energy saving programs such as demand response programs, concrete energy savings are a clear measure of success. In 2018, PPL’s U.S. customers participating in reduction programs have reduced demand by 190 megawatts. Approximately 889,976 participants have benefited from PPL EU and LGE and KU’s customer education programs. In addition to helping customers reduce their own energy consumption, engagement helps increase awareness among all stakeholders regarding PPL’s sustainability efforts, carbon goals and energy efficiency programs.

Tree planting programs have resulted in increased environmental awareness and increased numbers of trees which provide numerous environmental benefits. PPL EU and LGE and KU combined have provided more than 80,000 trees. WPD’s program has also provided wildlife corridors for bees.

C12.3

(C12.3) Do you engage in activities that could either directly or indirectly influence public policy on climate-related issues through any of the following?

- Direct engagement with policy makers
- Trade associations
- Funding research organizations

C12.3a

(C12.3a) On what issues have you been engaging directly with policy makers?

Focus of legislation	Corporate position	Details of engagement	Proposed legislative solution
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	Support	Monitoring policy discussions regarding grid resilience and fuel diversity. Support recognition that resilience of the bulk power system is a growing issue of policy focus due to the critical importance of the energy sector for national and economic security. Support a definition of resilience that values robust transmission and reliable energy supply, including 24/7 generation resources. Support policies that preserve flexibility of local solutions to optimize utilities' own resource portfolios.	There is no single legislative solution addressing this issue. It is woven into a variety of legislative and regulatory proposals.
Adaptation or resilience	Support	Supporting efforts to streamline and reduce the complexity, cost and time involved in licensing, permitting and review processes for infrastructure projects. Supporting policies that encourage (but not mandate) responsible investments that mitigate climate change impacts.	No specific legislation yet proposed. Any legislative solution should provide for expedited federal permitting decisions and improved cooperation among jurisdictions in order to facilitate siting and construction of transmission infrastructure.
Other, please specify Electric Vehicles and Distributed Energy Resources	Support with major exceptions	Supporting electric vehicles, charging infrastructure and national electric vehicle corridors. Efforts in Pennsylvania are focused on legislation allowing for utility-owned distributed energy resources and electric vehicle charging infrastructure. Opposing community solar proposals in Pennsylvania that impose significant administrative burdens on utilities and do not involve utility ownership components.	Pennsylvania legislation should provide for utility ownership of electric vehicle infrastructure as well as utility ownership of community solar for low-income customers.
Clean energy generation	Support	Support efforts to reform the net-metering laws to compensate excess generation fairly, minimize shifting private generation costs to other consumers and ensure that all customers are contributing fairly to the fixed cost of the energy grid.	Allow regulatory commissions to determine the value of excess energy generated by future net-metering customers.

		Successfully achieved such legislation in Kentucky.	
Other, please specify Nuclear subsidies	Oppose	Advocating against proposals in Pennsylvania which would create a zero-emission credit for nuclear energy and would require electric utilities to purchase up to 50% of customer load from nuclear facilities.	Legislation should take a market-based approach. If subsidies are to be provided, they must be based on demonstrated need.
Other, please specify Investment tax credit for energy storage	Support	Supporting efforts to provide the same investment tax credits for energy storage as is currently available for solar and other technologies.	Existing legislation providing investment tax credits for solar and other technologies should be modified to include energy storage technologies.

C12.3b

(C12.3b) Are you on the board of any trade associations or do you provide funding beyond membership?

Yes

C12.3c

(C12.3c) Enter the details of those trade associations that are likely to take a position on climate change legislation.

Trade association

Edison Electric Institute (EEI)

Is your position on climate change consistent with theirs?

Consistent

Please explain the trade association’s position

EEI recognizes that climate change presents one of the biggest energy and environmental policy challenges this country has ever faced. Policies to address climate change should seek to minimize impacts on consumers and avoid harm to U.S. industry and the economy. EEI has led the development of the first industry/investor-focused ESG reporting framework.

How have you influenced, or are you attempting to influence their position?

PPL’s Chairman, President and CEO is on the executive committee of EEI and is actively engaged in the development and refinement of EEI’s position on climate change. PPL’s Chief Financial Officer was a member of the EEI committee developing and refining the ESG reporting framework.

Trade association

American Gas Association

Is your position on climate change consistent with theirs?

Consistent

Please explain the trade association's position

AGA advocates for government rules and policies that protect the environment while allowing its natural gas utility members to continue to deliver clean, affordable natural gas to customers, safely and reliably. AGA has joined EEI's sustainability efforts by expanding the electric ESG reporting framework to the gas industry.

How have you influenced, or are you attempting to influence their position?

The Chief Operating Officer of the PPL subsidiary with gas operations is an advisory director for AGA and regularly provides input on AGA's policy positions.

Trade association

Energy Networks Association (ENA)

Is your position on climate change consistent with theirs?

Consistent

Please explain the trade association's position

ENA supports the U.K. Government target to deliver net-zero emissions by 2050. ENA actively promotes the role that energy networks will play in U.K. decarbonization engaging with Government and wider stakeholders to ensure that the policy and regulatory framework required to deliver the low carbon transition are closely aligned.

How have you influenced, or are you attempting to influence their position?

WPD's CEO serves as a Director on the ENA board, including the responsibility for the development and endorsement of ENA's position on climate change.

C12.3d

(C12.3d) Do you publicly disclose a list of all research organizations that you fund?

Yes

C12.3f

(C12.3f) What processes do you have in place to ensure that all of your direct and indirect activities that influence policy are consistent with your overall climate change strategy?

All direct and indirect activities that influence policy are directed by, or communicated to, PPL's Vice President-Public Affairs and Sustainability and coordinated with external affairs/government relations across the enterprise to ensure proper alignment of significant policy-related activities. The Corporate Sustainability Committee is engaged, as necessary, and

information is reviewed with the expanded corporate leadership council as appropriate. PPL's Board of Directors are apprised of significant legislative and policy issues and company positions annually, and additionally, as needed. In addition, corporate leadership and the board receive a report of corporate political contributions and trade association memberships, which are also made available on PPL's corporate website.

C12.4

(C12.4) Have you published information about your organization's response to climate change and GHG emissions performance for this reporting year in places other than in your CDP response? If so, please attach the publication(s).

Publication

In voluntary sustainability report

Status

Complete

Attach the document

 PPL-Corporate-Sustainability-Report-2018.pdf

Page/Section reference

Pages: 8-9, 12, 17, 19, 24-25, 31-40, 43-50, 81-85

Content elements

Governance

Strategy

Risks & opportunities

Emissions figures

Emission targets

Other metrics

Other, please specify

operational, community, employee, environmental

Comment

PPL's response to climate change and GHG emissions performance are included throughout PPL's 2018 Sustainability Report but are primarily addressed in the following sections: Key Metrics (p. 8), Advance a Clean Energy Future (34-43); Build Tomorrow's Infrastructure (44 -50); PPL's Contribution to U.N. Sustainable Development Goals; and Appendix which contains data aligned with GRI indicators.

Publication

Other, please specify

EI ESG Report

Status

Underway – previous year attached

Attach the document

 PPL_Corp-EEI-ESG-2017-Report-web.pdf

 2017-EEI-ESG-Report-Quantitative-PPL (2).pdf

Page/Section reference

Pages 2-5

Content elements

- Governance
- Strategy
- Risks & opportunities
- Emissions figures
- Emission targets
- Other metrics
- Other, please specify
operational, employee, environmental

Comment

The EEI ESG report enables consistent reporting of key metrics for investor-owned utilities. Metrics include climate-related emissions reporting, as well as a qualitative section that provides an overview of key sustainability-related initiatives and a climate response following the TCFD categories of reporting.

C14. Signoff

C-FI

(C-FI) Use this field to provide any additional information or context that you feel is relevant to your organization's response. Please note that this field is optional and is not scored.

C14.1

(C14.1) Provide details for the person that has signed off (approved) your CDP climate change response.

	Job title	Corresponding job category
Row 1	Vice President-Public Affairs and Sustainability	Chief Sustainability Officer (CSO)



Submit your response

In which language are you submitting your response?

English

Please confirm how your response should be handled by CDP

	Public or Non-Public Submission	I am submitting to
I am submitting my response	Public	Investors

Please confirm below

I have read and accept the applicable Terms