S. 1205

Local Energy Supply and Resiliency Act of 2013

City of the Future

Increasing the Resiliency and Efficiency of our Energy Supply

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"Making buildings and industries energy efficient boosts the economy, saves money, and creates jobs right here in Minnesota…Using 'waste heat' is just another way our businesses can save money through becoming more efficient. By eliminating barriers that stand in the way of saving money, we can help them achieve that goal."

– Senator Alan Franken

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Executive Summary

In October of 2012, Hurricane Sandy hit the East coast of North America, causing widespread destruction and power outages that reached as far west as Michigan. Large areas of lower Manhattan also lost power. However, there was one area that remained lit during the widespread blackout: New York University. This campus had electricity because it is powered by an independent and resilient energy system. That energy system is a smart microgrid. The S. 1205 Congressional Bill titled 'Local Energy Supply and Resiliency Act of 2013' aims to help cities all across the United States achieve that same level of resiliency, especially in the face of changing climate conditions that will continue to increase frequency and intensity of extreme weather. Although the S. 1205 Act did not pass in Congress, this management simulation provides a program design that sets priorities for implementation of this Act. In this plan we address the fundamental management issues of: budgeting, staffing and human resources, organizational structure and contracting, performance measurement, and operational planning.

The Act promotes the development of local energy infrastructure by establishing a technical assistance program and a loan guarantee program to increase energy system resiliency, increase energy efficiency, promote industrial competitiveness, and encourage local economic development. The Act identifies combined heat and power (CHP) generation systems and smart microgrids as technologically efficient, resilient, and reliable energy systems. Combined heat and power and smart microgrids can help make energy generation and transmission more efficient. CHP systems recover and reuse the wasted heat produced during energy generation by fossil fuel plants that would otherwise be lost to the environment. By converting that waste heat into a useful source of energy, a power plant's efficiency may be increased by 20-40 percent.

Smart microgrids play a crucial role in decentralizing energy transmission. Smart microgrids aggregate and transmit energy from local sources to homes and businesses. Smart microgrids can draw electricity from small-scale fossil fuel plants as well as renewable energy plants such as solar, wind and biomass. Furthermore, they have the capacity to function independently from the main grid, which makes areas that operate off of a smart microgrid more resilient to natural disasters such as Hurricane Sandy.

Retrofitting our current energy systems to include these technologies is capital-intensive and requires considerable investment. The Local Energy Supply and Resiliency Act provides financial grants and loan guarantees for institutions and localities to deploy these technologies. Through the technical assistance program, project developers are provided grants for feasibility assessments and blueprint design. The loan guarantee program provides loans at a low interest rate and a long payback period for the construction phase of these projects. In order to successfully implement the Act, a key goal is to maximize the funding impact and to also ensure that these projects serve as models for other localities and institutions to follow. The program design is divided into two segments – one segment

focuses on five cities that are to be chosen as model cities titled "Cities of the Future" program and the other segment is to provide funding for individual smaller scale projects.

The "Cities of the Future" program, to be administered by the United States Department of Energy, will select five cities through a competitive process based on the criteria of minimizing negative environmental impact, maximizing local job creation and increasing industrial competitiveness. To implement the Act, a new department called the Smart Cities Infrastructure Deployment Office will be created under the Office of Electricity Delivery and Energy Reliability in the Department of Energy. The five chosen cities will be provided with grants and loans to help them implement energy projects outlined in their applications. When successfully implemented, these projects will encourage private lenders to invest into these technologies. At the end of four years, five model cities in the United States will have successfully retrofitted their energy systems, increasing its efficiency and significantly reducing their greenhouse gas emissions while simultaneously building energy resiliency to future disasters. These would be energy efficient, low carbon demonstration cities for domestic and international urban centers to emulate.

Introduction

Overview

- Up to 36% of energy is lost from power plants, industrial facilities and buildings in the form of waste heat.
- A malfunction or a system failure may trigger a series of failures across a major grid
- S.1205 promotes the use of two energy systems – combined heat and power and smart microgrids

Democrat Senator Alan Franken of Minnesota in the 113th Congress proposed S.1205, the Local Energy Supply and Resiliency Act of 2013. The Act promotes the development of local energy infrastructure by establishing a technical assistance program and a loan guarantee program to increase energy system resiliency, increase energy efficiency, promote industrial competitiveness, and to encourage local economic development. The Act identifies combined heat and power generation systems and smart microgrids as examples of technologically efficient, resilient, and reliable energy systems. This management simulation provides a design for the program that sets priorities for implementation. In this plan we address the fundamental management issues of: budgeting, staffing and human resources, organizational structure and contracting, performance measurement and operational planning.

Key Issues

At present, up to 36% of energy is lost from power plants, industrial facilities, and buildings in the form of waste heat[1]. Waste heat is a byproduct of the natural process of energy conversion. During energy or heat production, primary fuels are being converted from one form of energy to another. In accordance with the second law of thermodynamics, which dictates that a heat engine can never reach 100 percent efficiency, high-energy thermal combustion will always produce a surplus of low-temperature heat. In the case of traditional energy generation systems, this waste heat is discarded to the surrounding environment[2]. This discarded energy is seen in many of our energy infrastructure processes, from transmission and distribution lines to power plants and boilers, and represents the inherent inefficiency associated with our current energy infrastructure.

In traditional power plants, up to 60% of the energy inputs may be lost in the form of waste heat. This means that even more fuel must be burned to make up for this loss, which

[1] D.Wang , A. Bao, W. Kunc, W. Liss. Coal power plant flue gas waste heat and water recovery. Applied Energy 91 (2012) 341–348.
[2] Dincer and Y.A. Cengel. Energy, Entropy and Energy Concepts and Their Roles in Thermal Engineering. *Entropy* 2001, *3*, 116-149

contributes to human health issues, climate change, and decreased infrastructure reliability. In addition to waste heat, burning fossil fuels releases into the atmosphere other atmospheric contaminants such as water vapor, carbon dioxide (CO_2), oxygen (O_2), nitrous oxide (NO_2), and sulfur dioxide (SO_2), and particulate matter. These components travel alongside the waste heat with wind, potentially impacting both the environment and human health. Increased greenhouse gas concentration in the atmosphere contributes to global warming, ocean acidification, disturbed the nutrient levels in the soil, among many other environmental degradations. In addition, inhaled particulate matter can be harmful to the cardiovascular and respiratory functions.

The American energy distribution system's centralized grid is another constraint the United States must address with regard to energy system upgrades. A major grid such as the Western North American grid consists of large interconnected networks with over 1,600 connection points. Due to the long distance that electricity must travel to reach substations or end users, a large amount of energy is lost in transmission and distribution[3]. Furthermore, a malfunction or a system failure may trigger a series of failures across the grid. For instance, the 2003 Northeastern blackout left over 10 million people in Ontario and 45 million people in eight U.S. states[4]. Similarly, during Hurricane Sandy, twenty U.S. states plus the District of Columbia experienced power outrage due to disruptions in electricity transmission lines[5].

Technical Solutions

S.1205 promotes the use of two energy system technologies that can help cities, industry, universities, hospitals, and other institutions capture waste heat and use renewables for heating, cooling, and power generation. These are: combined heat and power (CHP) systems and smart microgrids.

Combined heat and power, also known as cogeneration, refers to a group of technologies that operate together to generate electricity and recover waste heat, often in close proximity to the point of consumption. Cogeneration is considered superior to separate generation of heat and electricity - a prevalent practice across the U.S - because of its inherent higher efficiency and the ability to reduce transmission losses. A CHP plant may generate electricity and heat from both single and multiple fuel sources. Energy recovery is achieved through a heat waste recovery boiler, where the heat that travels through the boiler heats water and generates steam. The steam then travels through pipes and supplies district heating directly, or more electricity can be produced by a steam turbine. In

[3] "Research: Microgrids Better than One Massive Grid." *Latest News*. N.d., n. Web. 14 July 2014.
[4] U.S.-Canada Power System Outage Task Force. Final Report on the August 14, 2003 Blackout in the United States and Canada: Causes and Recommendations. April 2004.
[5] Mansfield, Matthew. and William Linzey. Hurricane Sandy Multi-State Outage & Restoration Report: CASE NO: 9308. February 1, 2013.

Manhattan alone, over 100,000 buildings use the steam distributed from seven cogeneration plants in their heating and cooling system[6].

Smart microgrids are decentralized electricity grid systems that may operate independently from traditional grid infrastructure, with the ability to function continuously without having to draw from a central source. These systems, rather than simply having an on and off switch to control the flow of energy from suppliers to consumers, have built-in information technology and telecommunication functions that allow remote control of energy distribution based on real-time consumption patterns that are constantly in flux. This increases energy resiliency in local areas that are running off of a smart microgrid, with the ability to prevent potential blackouts from sudden interruptions in energy supplies (e.g. malfunctions in traditional grid infrastructure, extreme weather events, physical or cyber-attacks). Improved energy reliability will guarantee increased security across many sectors that require a constant energy supply, such as banking, traffic systems, and medical centers. Another benefit of smart microgrids is that they are capable of utilizing distributed generation and small-scale renewable power generators to meet electricity needs. By incorporating renewable power generators into electricity grid, the energy supply system can not only become resilient to potential blackouts by diversification of energy source but also become environmentally sustainable, reducing burning fossil fuels and minimizing associated environmental problems.

Current Political Context

Many American cities and localities today are facing the physical stresses of a growing population, economic expansion and subsequent infrastructure development, and there is increasing energy demand to sustain this rapid growth. Our current energy generation systems are becoming less equipped to supply electricity sustainably, and lack of federal movement has forced cities to take energy initiatives into their own hands. City and regional initiatives such as PlaNYC and the Regional Greenhouse Gas Initiative (RGGI) demonstrate the need to combat energy and sustainability issues on a local level. The United States' heavy reliance on fossil fuels will result in an upward trend in air pollution and greenhouse gas emissions, exacerbating climate change and posing increased human health risks. The Local Energy Supply and Resiliency Act of 2013 proposes a solution, which is the springboard for changing the way that American cities provide energy to its residents. Energy efficiency is the backbone of this proposed bill. By enhancing energy efficiency and producing a higher return on investment from our current fossil fuel burning practices, American cities will be more prepared to adapt to the changing energy future.

[6] Energy Resource Center. Cogeneration – What is the world's largest cogeneration system?. Allana Buick & Bers, Inc. Accessed on December 1, 2014. Retrieved from http://energyplace.com/index.php?option=com_content&view=article&id=2&Itemid=9.

Legislative Background

Overview

- The Public Utilities Regulatory Policies Act of 1978 resulted in the increase in the number of combined heat and power plants
- Energy Policy Act of 2005 authorizes loan guarantees for innovative technologies that avoid greenhouse gases.
- Energy Standing Committee of the United States Conference of Mayors unanimously passed a resolution in support of the bill.
- The Act was opposed by Lisa Murkowski, a Republican senator from Alaska, raised questions about deficit issues.

Political Background

In order to understand S.1205, The Local Energy Supply and Resiliency Act of 2013, it is necessary to recognize the legislative history of policies for clean energy and energy efficiency. As the Public Utilities Regulatory Policies Act of 1978 (PURPA), the first piece of legislation for clean energy, largely in response to the energy crisis that many industrialized economies were facing. The price of oil was expected to rise to $100 dollars a barrel. In light of this, the United States government sought to reduce dependency on foreign oil, increase energy efficiency, and diversify energy power production. PURPA required that electric utilities buy power from more efficient producers, including co-generation, or combined heat and power plants[7]. It is important to recognize that while this was a federal law, implementation was left to individual states, highlighting the varying needs as well as regulatory policies in each state. This set a precedent for the types of technologies that S. 1205 seeks to install in communities and cities across the country.

The second piece of legislation preceding S.1205 is the Energy Policy Act of 2005. In addition to promoting subsidies for wind and other alternative energy sources, this Act authorizes loan guarantees for innovative technologies that avoid greenhouse gases. It is within this existing loan guarantee program, which S.1205 amends and re-directs a portion of its funds S.1205 seeks to re-direct. Congress has provided a total of $60 billion in loan or loan guarantee authority ($34.8 billion in loan guarantees for Section 1703 and $25 billion for the Advanced Technology Vehicles Manufacturing (AVTM) loan program). To date, no loan guarantees have been made under the 1703 program and only $8.4 billion in loans have been made in the ATVM program. Of the remaining total $51.4 billion in authority, S.1205 would redirect less than 8 percent to the S.1205 loan guarantee program[8].

[7] Union of Concerned Scientists, USA. *Public Utility Regulatory Policy Act (PURPA).*
[8] U.S. Government Printing Office. ENERGY EFFICIENCY BILLS. *Hearing before the Subcommittee on Energy*.

Support and Opposition to S. 1205

Supporters of the S.1205, including elected officials, experts and stakeholder groups, emphasize that the energy systems and technologies promoted in the Act provide an important opportunity for improving efficiency and economic competitiveness, protecting the environment, and harnessing thermal energy that would otherwise be lost. The energy efficiency provisions in the Act received wide support, as few people disagree with the need to conserve and save energy where appropriate.

The Energy Standing Committee of the United States Conference of Mayors, a non-partisan organization of cities with populations of 30,000 or more unanimously passed a resolution in support of this bill titled "In Support of Combined Heat and Power to Promote Energy Efficiency," at their annual meeting in 2013[9]. The collective Mayors of the Energy Standing Committee represent cities in states from Oregon, California, Florida, Texas and Massachusetts.

During the Senate hearing for S.1205 in the Energy and Natural Resources Subcommittee, fiscal concerns were raised regarding the loan guarantee program[10]. Those voices questioned the need to create a new program for local energy infrastructure, and reserving $4 billion of the existing loan volume limitation for it. In particular, Lisa Murkowski, a Republican senator from Alaska, raised questions about deficit issues, wondering why money should be given to states when the federal government is facing a large deficit, and secondly, raising concern with taxpayer dollars being used to cover the credit subsidy on loan guarantees. In this regard, some Republican politicians argue that technical assistance should be largely handled by the private sector as a mechanism to avoid risky federal investments.

[9] The U.S. Conference of Mayors : Energy.
[10] Government Printing Office. ENERGY EFFICIENCY BILLS. Hearing before the Subcommittee on Energy.

Program Design

Overview

- Technical Assistance Program provides assistance to identify, evaluate, plan and design the local energy systems
- The Act amends Title XVII of the Energy Policy Act of 2005 to reserve $4 billion for the creation of the Local Energy Infrastructure Loan Guarantee Program.
- "City of the Future" is an innovative competitive program that selects five cities across the United States to serve as demonstration cities.
- The program also allocates 20% of the available funding in both the technical assistance and loan guarantee programs for standalone projects.

Goals of the Program

This management simulation provides a design for the program that sets priorities for implementation. The team identified four major goals that would guide the program design:

- **Maximizing the grant and funding impact** to ensure the limited money available can help develop infrastructure in the most effective manner.
- **Ensuring competitiveness among entities** to encourage those institutions that are ready to go as well as those who still need to figure out the specifics.
- **Maintaining inclusivity** by helping as many states as possible to get the benefit of this bill.
- **Developing model infrastructure** to serve as demonstration projects for future such initiatives.

Financial Tools Mandated by the Bill

The purpose of the S.1205 is to provide funding for more efficient and resilient energy infrastructure through the establishment of two financial assistance programs, the Technical Assistance Program and the Local Energy Infrastructure Loan Guarantee Program.

Technical Assistance Program

The Technical Assistance Program is designed to provide assistance in identifying, evaluating, planning, and designing the required local energy infrastructure. The total amount of budget appropriated for technical assistance program is **$150,000,000** for the period of fiscal years 2014 through 2018. Projects are chosen based on criteria aiming to maximize elimination of fossil fuel use and strengthen the resiliency of local energy infrastructure. Technical assistance is to be provided in the form of grants to cover no more than:

- 100 percent of the cost of initial assessment to identify local energy opportunities
- 75 percent of the cost of feasibility studies to assess the potential for the implementation of local energy infrastructure
- 60 percent of the cost of guidance on overcoming barriers to the implementation of local energy infrastructure, including financial, contracting, siting, and permitting issues
- 45 percent of the cost of detailed engineering of local energy infrastructure

Local Energy Infrastructure Loan Guarantee Program

The Act amends Title XVII of the Energy Policy Act of 2005 to reserve $4 billion for the creation of the Local Energy Infrastructure Loan Guarantee Program. This program gives the Secretary of Energy the power to make loan guarantees for commercial or innovative projects that can be defined as "local energy infrastructure." The Secretary will reserve **$4,000,000,000** for these local energy infrastructure projects under S. 1205. Loans are managed under the Department of Energy's Loan Guarantee Program Office (LGP) and are designed to support innovative clean energy technologies that are typically unable to obtain conventional private financing due to high technology risks.

City of the Future

"City of the Future" is an innovative competitive program that selects five cities across the United States to serve as demonstration cities with the greatest potential to increase energy efficiency and resiliency. The five cities are chosen based on comprehensive application criteria encompassing greenhouse gas emissions reductions, energy infrastructure upgrades, and local economic development.

The City of Future program design will ensure a "lead by example" effect. By distributing the funding to only 5 cities, the funding money is concentrated to allow these pilot cities to make innovative city-wide changes. This program will encourage cities to implement energy efficiency and infrastructure projects, allowing them to become more sustainable and resilient. These projects will serve as pioneers for cities interested in similar energy system planning. At the end of the program, the five "Cities of the Future" will become case studies for other cities.

The program allocation design is based on the assumption that the program will not receive from Congress the full funding as mandated by the Act. Our program assumes that there will be allocated **$100,000,000** for the Technical Assistance Program and **$2,000,000,000** for the Local Energy Infrastructure Loan Guarantee Program. Eighty percent of the funding will be disbursed under this "City of the Future" program. This design maximizes funding impact by narrowing the scope of the program thus allowing more money per project. Each city will be given an equal allocation of funding for both the Technical Assistance Program and the Loan Guarantee Program. Applications will take into account entities that can leverage outside funding, thus encouraging local economic development. Priority for the loan guarantees will be given to projects that have

participated in the Technical Assistance Program. This is to ensure that projects that have been vetted by the program team will have access to financing. However, loans will still be available for projects that are "shovel-ready," or have completed their feasibility studies and just require the loan guarantee.

The program design team will focus selection of the five demonstration cities loosely based on the following criteria as mandated by the Act:

- Minimize negative environmental impact,
- Maximize local job creation,
- Increase industrial competitiveness,
- Reduction of fossil fuel use, and
- Increased used of renewable energy.

These five criteria will be further developed in the final application criteria and program design phase under the program administrative team in the Department of Energy, discussed later.

Standalone Projects

Additionally, the program allocates approximately 20% of the available funding in both the technical assistance and loan guarantee programs for standalone projects in other US cities. This is a "fast-track" program option that would make the grant and the loan money available across all states, focusing on "shovel-ready" projects with the greatest energy savings impact. The application process will open every six months and any public or private institution that was interested in taking advantage of the grant money could apply. The objective is to allow the federal funding to reach as many beneficiaries as possible outside of the City of the Future program. Due to the smaller size of the funding pool, applicants are expected to get a smaller amount of funding and will be required to leverage outside funding sources.

Program Staffing Plan

Overview

- A new division called Smart Cities Infrastructure Deployment will be created.
- To lead the new division, a GS15 level Director will be hired and three Supervisors (GS14 level) will report to the Director.
- Five industry consultants will help draft the application and will be involved in the selection process.
- The program will be implemented in five steps – application drafting, program marketing, application query, city selection and grant disbursement.

Given the program's unique dual focus on cogeneration and microgrid technologies, a new division called **Smart Cities Infrastructure Deployment** will be created. This will be housed under the Office of Electricity Delivery and Energy Reliability in the Department of Energy (DOE). The benefit of housing the program under this office is that it has expertise in energy infrastructure risk analyses, reliability assessments, and smart grid grant investment programs. (See Appendix A.)

Program Supervisory Team

The Assistant Deputy Secretary of Power Systems Engineering Research and Development will act as Lead Program Manager of Smart Cities Infrastructure Deployment and give strategic direction to the program.

To lead the new division, a GS15 level[11] Director will be hired to work on the implementation of the program and will set the criteria, deadlines and the processes.
Three supervisors (GS14 level) will report to the Director.

- **Supervisor, Strategic Program Development**
  He or she will be tasked with strategizing about the application criteria and selection.
- **Supervisor, Technology Services**
  He or she will be responsible for the technological aspect of the program
- **Supervisor, Financial Services**
  He or she will be in charge of the finance - budgets, grants and loan guarantee applications.

Four junior level staff members (GS11 level) will assist the division: a supervisory contract specialist, a program analyst, a project coordinator and an interagency coordinator. They

[11] The General Schedule (GS) is the pay scale of U.S federal employees, especially those in professional, technical, administrative or clerical positions. It ranges from GS1 (lowest) to GS15 (highest). For more details, see Appendix 2.

will have their own level of specialization. For example, the Supervisory Contract Specialist will execute contracts and the financial assistance instruments. The Interagency Coordinator on the other hand will coordinate with consultants from other divisions within the Department of Energy we will be partnering with to ensure timelines are met. All of these personnel, with the exception of the lead program manager, will be hired; preference will be given to interdepartmental transfers.

Collaborations with different DOE offices and external agency
The team will collaborate with three members of other Department of Energy offices for application criteria setting.

- Smart Grid Research and Development Division (Office of Electricity Delivery and Energy Reliability)
- Combined Heat and Power deployment (Office of Energy Efficiency and Renewable Energy)
- Technical Research (National Energy Technology Laboratory).

Collaboration with staff from other departments is crucial for ensuring applications cover all necessary technological and financial aspects since these staff members are specialized in their field. Five independent consultants who have industry experience in energy efficiency, infrastructure reliability assessment and advanced digital technologies will also help draft the application criteria and selection process.

The Office of Public Affairs and Communications in the Department of the Office of Energy Efficiency and Renewable Energy will be responsible for program marketing, in order to avoid hiring another specialized staff member for this purpose.

The city selection process will consult with the Secretary of Energy and the White House because selection is inevitably a political process and will need higher-level validation.

Program Implementation

This section outlines the program implementation steps through year 1 of the program. In this phase the program team will be selected and they will develop the application criteria and program design.

Step 1: Application Drafting and Design
The program supervisory team (discussed in next section) will set the criteria under which the cities need to apply, based on the goals identified in the Act. They will develop metrics and draft the applications in conjunction with a consultant team made up of industry experts.

Step 2: Program Marketing
The Office of Public Affairs and Communications within the Department of the Office of Energy Efficiency and Renewable energy will handle program marketing. Once the

application is set, the competition be advertised in the press. Information about the competition will be disseminated to a variety of sources including local governments, national trade associations, and energy service companies in order to encourage maximum participation by cities.

Step 3: Application Query Process

Once the application has opened, cities will be given 3-6 months to get the applications ready. During this time, they can get their queries about paperwork and reporting requirements resolved. The program supervisory team will address application queries.

Step 4: City Selection

Once the application submission deadline is passed, an appointed committee will review all the applications and select the five cities that will serve as our model cities. Selection will be competitive based on a comprehensive review of the environmental, resilience, and economic criteria set by the program design team. The Secretary of Energy and the White House will have final approval of city selection.

Step 5: Grant Disbursement and Loan Authorization

Once the 5 Cities of the Future have been announced, the grant disbursement process will begin and cities will receive funding for the projects participating in the Technical Assistance Program. Following completion of the program, projects are expected to have prepared feasibility studies and are ready to enter the Loan Guarantee Program stage. The Program Lead Manager will work with the Department of Treasury and Federal Financing Bank to disburse funds.

Program Budget

Overview

- The estimated budget for the year will be approximately $1.6 million and $1.8 million for the second year.
- The program budget is based on the calendar year rather than the fiscal year.

This section outlines the program budget for program years 1 and 2. The estimated budget for the year will be approximately $1.6 million and $1.8 million for the second year. Year 1 and Year 2 budgets show discrepancies because the first year will require less staff to set up the program, and the second year will require all staff to implement the program. The Year 2 budget will reflect the annual budget for the remainder of the program, not accounting for inflation and rising costs of living.

It is important to note that the budget outlined here is based on the calendar year rather than the fiscal year. This is because the program is slated to start with the calendar year on January 1, 2015. This budget also does not include funding figures for the Technical Assistance Program or Loan Guarantee Program Budget.

Travel & Other Related Expenses Budget

As the Smart Cities Infrastructure Deployment division will be created under the DOE Office of Electricity Delivery and Energy Reliability (OE), the Office of Energy Efficiency and Renewable Energy (EERE) headquarters 2014 Program Direction budget request[12] is used as a model for two budget items for this program ("Travel" and "Other Related Expenses").

The DOE EERE headquarters budget for Program Direction includes the following 4 items for 80 Full Time Equivalents (FTEs):

1. Salary & Benefits: $12,871,000
2. Travel: $650,000
3. Support Services (consultants): $2,915,000
4. Other Related Expenses: $4,241,000

Here, support services includes contractor support directed by the federal staff to perform administrative tasks and provide analysis to management, and other related expenses includes "corporate IT support and working capital expense, such as rent, supplies, copying, graphics, mail, printing, and telephones"[13]

[12] http://energy.gov/sites/prod/files/2013/04/f0/Volume3_1.pdf
[13] http://energy.gov/sites/prod/files/2013/04/f0/Volume3_1.pdf

Table 1: DOE EERE Program Budget

Budget Item	Total EERE budget (80 FTEs)	Budget per FTE
Travel	$650,000	$8125
Other Related Expenses	$4,241,000	$53,012

Table 1 above shows the calculations for estimated travel and other related expenses budget per Full Time Equivalent. This number is then used to calculate the final budget with the number of FTEs needed in year 1 and year 2 of this program.

Salary & Benefits Budget

Government Staff have very strict pay guidelines. The Executive Order for 2014 Pay Schedules[14] specifically outlines these guidelines and show the government salaries for different employees. This program requires one GS15 employee, three GS14 employees, and four GS11 employees.

In determining salaries, the team assumed that the employees will be based out of Washington, D.C. and that they will have a level 5 Within-Grade Increase (WGI). WGIs are increases in a GS employee's rate of basic pay from one step of the grade of his or her position to the next higher step of that grade. The employees hired for this program would have to be somewhat experienced so we are looking for employees with previous experience in the government, translating to a level 5 WGI. Also, the salaries are adjusted for locality to reflect different costs of living in certain cities. The Washington, D.C. locality adjustment rate is 24.22%. **Table 2** below shows the differences that these adjustments have on the final salary and benefits of the different level employees.

Table 2: GS Level Salary Adjustments

Employee Level	Original Salary	WGI Level 5 Salary	WGI Level 5 Salary Adjusted for D.C. Locality
GS11	$50,790	$57,562	$71,503.52
GS14	$85,544	$96,948	$120,428.81
GS11	$100,624	$114,040	$141,660.49

[14] http://www.opm.gov/policy-data-oversight/pay-leave/salaries-wages/pay-executive-order-2014-adjustments-of-certain-rates-of-pay.pdf

Support Services Budget

There are some limits set on maximum pay for support services (consultants) in the government as to prevent nepotism. However, the DOE does not have such as limit. In order to calculate a reasonable estimate for a government consultant, we have taken the midpoint of the range of maximum pay for support services across different departments of the government. The lowest maximum pay for support services was $300 a day for the US State Department, and the highest maximum pay was $521 a day for the National Science Foundation. **Table 3** below shows the calculations performed to find the midpoint hourly wage for support services.

Table 3: Support Services Budget Calculation

Department	Daily Rate (8-hour work day)	Hourly Rate
US State Department	$300	$37.50
Midpoint	**$410.50**	**$51.31**
US State Department	$521	$65.13

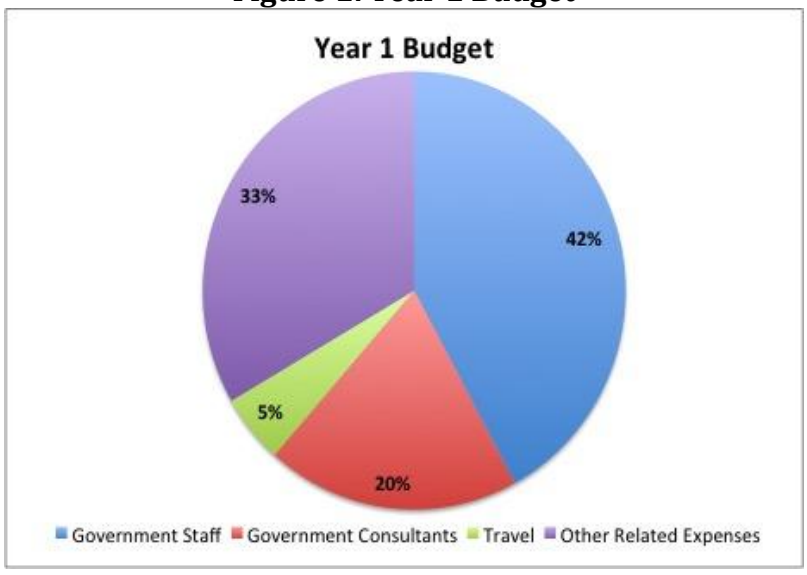
Total Budget Breakdown

The Smart Cities Infrastructure Deployment division program budget for year 1 is:

1. Salary & Benefits: $668,532.16
2. Travel: $81,250.00
3. Support Services (consultants): $307,860.00
4. Other Related Expenses: $530,120.00

The breakdown is illustrated in **Figure 1** below, and the full budget can be found in Appendix C:

Figure 1: Year 1 Budget

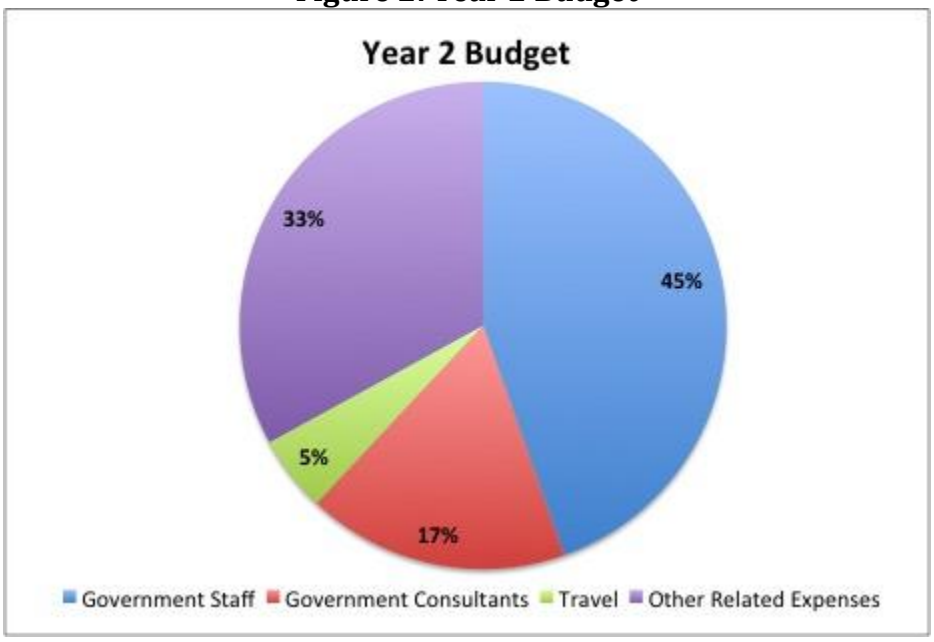


The Smart Cities Infrastructure Deployment division program budget for year 2 is:

1. Salary & Benefits: $788,960.97
2. Travel: $89,375.00
3. Support Services (consultants): $307,860.00
4. Other Related Expenses: $583,132.00

The breakdown is illustrated in **Figure 2** below, and the full budget can be found in Appendix C:

Figure 2: Year 2 Budget



Program Calendar

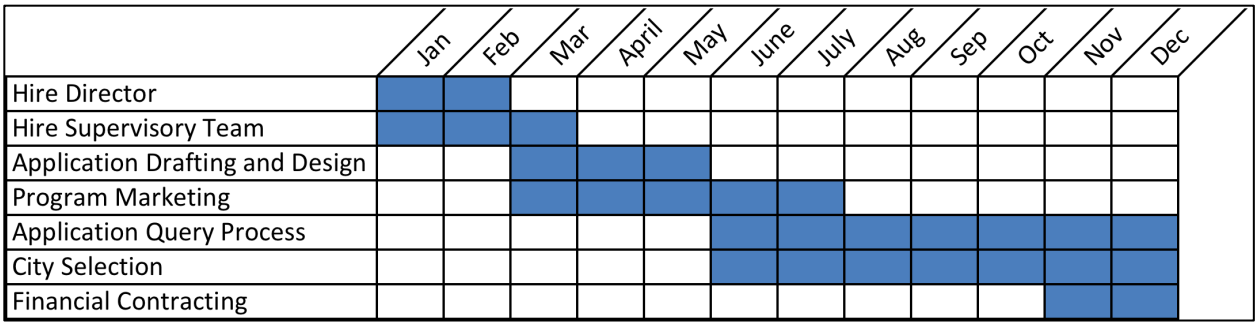
Overview

- All major tasks involved in establishing and initiating the "City of the Future" program will be completed by the end of year 1.
- Year 2 will focus on the distribution of funds to the Five Cities
- By year 4, all Five Cities will be tentatively scheduled to start the initial phases of the construction process.

Master Calendar

The master calendar is designed to delineate a number of tasks and subtasks involved in carrying out the objectives of the proposed program. While drawing from these works, the master calendar organizes the tasks to emphasize the timing aspects of the program. In addition, the master calendar sets a proposed one-year timetable for the program by breaking each task/subtask down into allotted time periods and deadlines. **Figure 3** below shows the breakdown of Year 1 tasks. (See Appendix C for detailed calendar.)

Figure 3: Year 1 Calendar



All major tasks involved in establishing and initiating the "City of the Future" program - including hiring and department setup - will be completed by the end of 2015. While the Department of Energy Office of Electricity Delivery and Energy Reliability will work with all staffing organizations to implement the legislation according to this timeline, it should be acknowledged that this is a tentative schedule subject to changes and delays.

Regarding all subsequent years of the four-year program, Year 2 will focus on the distribution of funds to the Five Cities. Years 2 and 3 will heavily rely on the use of the technical assistance grants in order to evaluate, conduct feasibility studies, and plan for the construction phase. By Year 4, all Five Cities will be tentatively scheduled to start the initial phases of the construction process, which will be facilitated by the Loan Guarantee portion of the legislation.

Measuring the Success of the Program

Overview

- The success of the program is based on technical and operational indicators developed on the goals of the program design
- We will be able to evaluate whether or not the program needs to be modified or changed.

The success of the program will be measured using performance indicators as a monitoring and evaluation tool. The DOE will use this tool to judge the project and its progress. This will help evaluate the different stages of the project and how different chosen cities are progressing. By using a standard process and accounting for size of the population, we will be able to evaluate whether or not the program needs to be modified or changed. It is important to measure how successfully a program has been implemented in order to see whether the goals of the project have been met as well as to judge whether it can be replicated and scaled up for future projects. The indicators are divided into technical indicators and operational indicators.

Technical Indicators of Program Success

Amount of energy savings per capita: To measure this indicator, the amount of energy used before the start and after the end of the project will be compared. The difference will indicate the amount of energy savings. For comparison across cities, the population of the city will divide this amount. This will be measured through audits of power plant generation on a half-yearly basis.

Reduction of fossil fuel usage per capita: To measure this indicator, the amount of fossil fuel usage in the city before the start and after the end of the project will be compared. The difference will give us the reduction of fossil fuel use. For comparison across cities, the population of the city will divide this amount. This will be measured through audits of power plant fuel use on a half-yearly basis.

Reduce number of average days of energy outage per capita: This is an indicator of the resiliency of a city's power grid. To measure this indicator, the number of days of energy outage before the start and after the end of the project will be compared. For comparison across cities, the population of the city will divide this amount.

Number of jobs created: To measure this indicator, the number of jobs before the start and after the end of the project will be compared. This is a technical indicator used for measurement of local economic development. This will be measured by looking at local area unemployment statistics published by the US Bureau of Labor Statistics.

Amount of capital attracted: This indicator will show us the amount of capital invested by other parties (private donors, local & state governments) into the projects and that the city is able to leverage. This indicator will be examined on an ongoing basis and will show us the usefulness and efficacy of the project by the interest and its impact on the local economy.

Operational Indicators of Program Delivery

Number of applications received from cities: This indicator will show us the interest shown in the project by different cities. It will show us the geographical preference of the applicants allowing us to gauge whether interest has been shown nationally or is restricted to a certain area.

Quality of application: The quality of applications received will be determined by how well the applications meet the eligibility criteria that was set. This will show the strength of their application. The number and quality of application will only be judged in the first year when applications will be received.

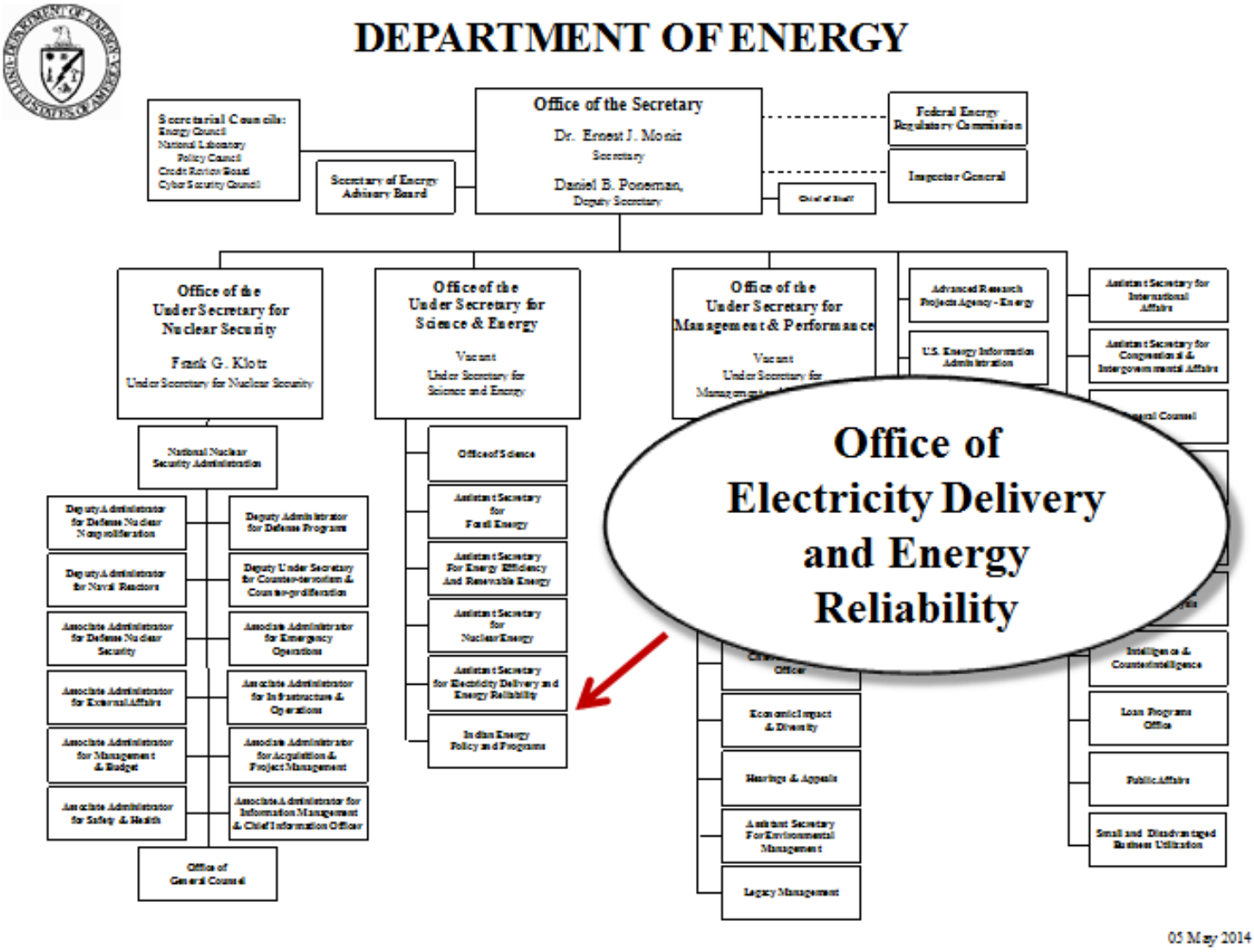
Money spent by cities on program goals: This indicator will show us how effectively the program is actually disbursing funds. We will examine the amount of money spent by cities and will be compared by the amount of money that was initially promised in the application. This indicator will be ongoing and will be helpful for mid-course corrections.

Conclusion

Our everyday lives and current economic system rely on energy processes to continue to function, and we therefore depend on their reliability, resiliency and efficiency. When that system fails, there are wide-scale impacts not only limited to the energy sector and the environment, but on all aspects of society: from livelihoods to access to education and healthcare. Moreover, the demand for this type of reliable energy will only continue to rise along with population growth and the expansion and integration of the US and global economy. Therefore, it is imperative that we improve the infrastructure and engineering of our standard energy generation, transmission, and distribution, in order to adapt to the changing earth systems as well as our modernizing and increasingly interconnected socio-economic ways of life.

The looming issue of climate change poses political difficulties for policy-makes to develop realistic, cost-effective, and implementable policies that fit the current economic structure, while also providing a transition to cleaner fuels. The S.1205 Local Energy Supply and Resiliency Act takes a proactive step in the right direction towards this transition. This Act provides concrete policy and financing mechanisms to implement more efficient and resilient energy systems at the local level. More importantly, it also includes a comprehensive framework to measure results and effectiveness. The City of the Future program can serve as a pilot demonstration of success for other cities, institutions, and communities to emulate. Climate change is a large-scale, global problem. The financial requirements to mitigate this issue seem immense. However, this Act seeks to provide a starting point for American cities by maximize funding impact, igniting change, and advancing technologies in the energy systems of metropolis areas.

Appendix A: US Department of Energy Existing Organizational Structure



Appendix B: Qualification Standards for General Schedule Positions

GENERAL POLICIES AND INSTRUCTIONS
Part E.4.(b) – E.4.(h)

(b) Qualifying Education or Training—The following table shows the amount and level of education typically required for each grade for which education alone can be qualifying. At GS-13 and above, appropriate specialized experience is required for *all* positions.

GRADE	QUALIFYING EDUCATION
GS-1	None
GS-2	High school graduation or equivalent
GS-3	1 academic year above high school
GS-4	2 academic years above high school, **or** Associate's degree
GS-5	4 academic years above high school leading to a bachelor's degree, **or** Bachelor's degree
GS-7	Bachelor's degree with Superior Academic Achievement for two-grade interval positions, **or** 1 academic year of graduate education (or law school, as specified in qualification standards or individual occupational requirements)
GS-9	Master's (or equivalent graduate degree such as LL.B. or J.D. as specified in qualification standards or individual occupational requirements), **or** 2 academic years of progressively higher level graduate education

GS-11	Ph.D. or equivalent doctoral degree, **or** 3 academic years of progressively higher level graduate education, **or** *For research positions only*, completion of all requirements for a master's or equivalent degree (See information on research positions in the qualification standard for professional and scientific positions in Section IV-A.)
GS-12	*For research positions only*, completion of all requirements for a doctoral or equivalent degree (See information on research positions in the qualification standard for professional and scientific positions in Section IV-A.)

Appendix C: Program Budget Year 1

LOCAL ENERGY SUPPLY AND RESILIENCY ACT - YEAR 1					
Line Item	**Specific Line Item**	**FTE's**	**Hours**	**Cost per Unit**	**Total Cost**
Government Staff					
Salary & Benefits	GS15 (1)	1	x	$141,660.49	$141,660.49
	GS14 (3)	2	x	$120,428.81	$240,857.61
	GS11 (4)	4	x	$71,503.52	$286,014.07
Total					$668,532.16
Government Consultants					
Salary	1 consultant = 2000 hrs/year	3	6000	$51.31	$307,860.00
Total (est. $3-10 million)					$307,860.00
Travel					
Travel	Transportation, subsistence, and incidental expenses	10	x	$8,125.00	$81,250.00
Total					$81,250.00
Other Related Expenses					
Office Expenses	Computers, Printers, Rent, meetings, events, etc.	10	x	$53,012.00	$530,120.00
Total					$530,120.00
FINAL TOTAL BUDGET					**$1,587,762.16**

Appendix D: Program Budget Year 2

LOCAL ENERGY SUPPLY AND RESILIENCY ACT - YEAR 2					
Line Item	**Specific Line Item**	**FTE's**	**Hours**	**Cost per Unit**	**Total Cost**
Government Staff					
Salary & Benefits	GS15	1	x	$141,660.49	$141,660.49
	GS14	3	x	$120,428.81	$361,286.42
	GS11	4	x	$71,503.52	$286,014.07
Total					$788,960.97
Government Consultants					
Salary	1 consultant = 2000 hrs/year	3	6000	$51.31	$307,860.00
Total					$307,860.00
Travel					
Travel	Transportation, subsistence, and incidental expenses	11	x	$8,125.00	$89,375.00
Total					$89,375.00
Other Related Expenses					
Office Expenses	Computers, Printers, Rent, meetings, events, etc.	11	x	$53,012.00	$583,132.00
Total					$583,132.00
FINAL TOTAL BUDGET					**$1,769,327.97**

Appendix E: Master Calendar

1. Hire Staff

1.1. Hire Director (by Lead Program Manager)

1.1.1. (Jan. 2, 2015 – Feb. 17, 2015)
1.1.2. (Jan. 2, 2015 - Jan. 7, 2015: Post a hiring position and receive application)
1.1.3. (Jan.10, 2015 - Jan.14, 2015: Evaluation)
1.1.4. (Jan.17, 2015 - Jan.28, 2015: Interviews)
1.1.5. (Jan.31, 2015 - Feb.18, 2015: Final decision)

1.2. Hire Supervisor of Strategic Program Development; 4 junior level staff members (GS9-11 level): a supervisory contract specialist, a program analyst, a project coordinator and an interagency coordinator; and 3-6 independent consultants (by Director) (Jan. 17, 2015-Mar. 24, 2015)

1.2.1. (Jan.17, 2015 - Feb.18, 2015; Post a hiring position and receive application)
1.2.2. (Feb.21, 2015 - Feb.25, 2015; Evaluation)
1.2.3. (Feb.28, 2015 - Mar.10, 2015; Interviews)
1.2.4. (Mar.13, 2015 - Mar.24, 2015; Final decision)

1.3. Hire Supervisor, Technology Services and Supervisor, Financial Services (by Director) (Jan. 17, 2015-July 24, 2015)

1.3.1. (Jan. 2, 2015 – Jan. 7, 2015; Post a hiring position and receive application)
1.3.2. (Jan. 10, 2015 - June 25, 2015; Evaluation)
1.3.3. (June 28, 2015 - July 10, 2015; Interviews)
1.3.4. (July 13, 2015 - July 24, 2015; Final decision)

2. Application Drafting and Design

2.1. (Mar. 27, 2015 – Mar. 27, 2015) Preliminary Meeting and Task Delegation
2.2. (Mar. 27, 2015 – May 29, 2015) Draft Five Cities Application
2.3. (May 30, 2015 – May 31-2015) Release Five Cities Application and prepare to receive applications

3. Program Marketing

3.1. (Mar. 27, 2015 – July 20, 2015) Market Five Cities Program

4. Application Query Process

4.1. (May 30, 2015 – May 31, 2015) Release of Five Cities Applications
4.2. (June 1, 2015 – Dec. 1, 2015) Receive and evaluate applications on a rolling basis
4.3. (Dec. 1, 2015 – Dec. 1, 2015) Deadline for submitting Five Cities application

5. City Selection

5.1. (June 1, 2015 – Dec. 1, 2015) Receive and evaluate applications on a rolling basis
5.2. (Sept. 30, 2015 – Dec. 1, 2015) Make final selections on Five Cities selection

6. Grant Disbursement and Loan Authorization

6.1. (Dec. 1, 2015 – Dec. 31, 2015) Financial contracts sent to and confirmed by the Department of Treasury
6.2. (Jan. 2, 2016 – Feb. 29, 2016) Distribution of funds to Five Cities Mayoral Offices