



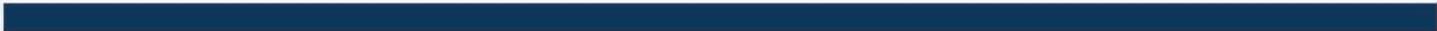
FINANCIAL INCENTIVES TO ENABLE CLEAN ENERGY DEPLOYMENT

POLICY OVERVIEW AND GOOD PRACTICES

Sadie Cox
National Renewable Energy Laboratory

*Prepared for the U.S. Department of Energy and the
Australian Department of Industry, Innovation and Science*

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Introduction

Financial incentives have been widely implemented by governments around the world to support scaled up deployment of renewable energy and energy efficiency technologies and practices. As of 2015, at least 48 countries have adopted financial incentives to support renewable energy and energy efficiency deployment (IEA/IRENA 2015). Broader clean energy strategies and plans provide a crucial foundation for financial incentives that often complement regulatory policies such as renewable energy targets, standards, and other mandates. This policy brief provides a primer on key financial incentive design elements, lessons from different country experiences, and curated support resources for more detailed and country-specific information on financial incentive design.

Financial incentives can address various barriers to renewable energy and energy efficiency technology deployment. For instance, financial incentives can improve access to capital, reduce the burden of high upfront costs, lower financing costs, support creation of new markets, and address split incentives associated with energy-efficient technologies.¹ Common renewable energy and energy efficiency financial incentives used to address these challenges include: tax measures; rebates, grants, and performance-based incentives; and loan programs, guarantees, and credit enhancements.² Each of these financial incentives is described in detail below.

Tax measures have been applied in various ways around the world to accelerate renewable energy and energy efficiency deployment and can be adapted to unique national circumstances. Common types of tax incentives are highlighted below.³

- **Corporate income tax incentives** can be tax deductions or credits for on-site use of renewable energy or energy efficiency technologies or for large-scale renewable energy that is fed into the grid. In relation to renewable energy, corporate investment tax credits are based on initial cost of renewable energy systems, while production tax credits are based on

Text Box 1. What is a Clean Energy Financial Incentive?

To address key market barriers, renewable energy and energy efficiency financial incentives provide some form of monetary benefit to support deployment of renewable energy and energy efficiency technologies. Common financial incentives include:

- **Tax measures** provide tax deductions or credits, and/or lessen or eliminate certain taxes to support renewable energy and energy efficiency deployment
- **Rebates, grants, and performance-based incentives** provide a direct cash incentive to support energy efficiency and renewable energy and do not require repayment
- **Loan programs, guarantees, and credit enhancements** are often designed to provide lower interest loans and/or reduce risk associated with loans for renewable energy and energy efficiency technologies and projects.

Sources: EPA 2015; World Bank 2013

¹ In many markets, builders have little financial incentive to construct energy efficient buildings because the subsequent owners or tenants will pay the energy bills and reap any benefits from lower costs. This is referred to as a “split incentive.”

² Other key financial incentives such as feed-in tariffs (Cox and Esterly 2016) and net metering are covered in previous policy briefs. Policies to support wind power deployment (Cox et al. 2015a) and solar power deployment (Cox et al. 2015b) are also addressed in previous policy briefs.

³ Examples drawn from Lantz and Doris (2009); EPA (2015); and SEIA (2015).

actual energy produced. Therefore, production tax credits can be more effective in incentivizing maximization of energy production over the long term. However, other tax incentives may also be required to address potentially high upfront investment costs.

- **Personal income tax incentives** are tax deductions or credits, normally based on investment or cost of a renewable energy system or energy efficiency technology.
- **Property tax incentives** are utilized when renewable energy systems (distributed or utility-scale) or energy efficiency technologies are implemented to improve a property. These incentives reduce the level of taxes associated with the property improvements.
- **Sales or value-added tax (VAT) incentives** lessen or eliminate sales or VAT taxes for energy efficiency and renewable energy technologies (applied at both the distributed and utility-scale levels) for individuals and/or businesses.
- **Accelerated depreciation** quickens renewable energy fixed asset depreciation and thus, through reducing taxable income, defers tax liability in the early stages of renewable energy project development.

While tax incentives can be relatively simple and flexible instruments to support renewable energy and energy efficiency deployment, these incentives are only available for entities that have a tax burden. As such, tax incentives often do not provide direct financial benefits for the poor or for non-profit and government entities. Good practices to address these important challenges are described below.

In addition to tax measures, **rebates, grants, and performance-based incentives** can be designed to support renewable energy and energy efficiency action and technology deployment. Rebates, grants, and performance-based incentives provide a direct cash incentive to support energy efficiency and renewable energy and typically do not require repayment. Grants can be provided before a technology is installed (e.g., for research, development, and demonstration; business development; or feasibility studies) or after a system is fully operational. Rebates are typically applied to discrete purchases such as appliances and vehicle purchases, and are often provided after purchase and/or installation. Performance-based incentives are provided based on actual performance of an installed technology (e.g., cents per kilowatt-hour payment).

Selected examples of direct cash incentive programs are highlighted below.

- **Rebates** are often provided by utilities and funded through utility customer payments. Rebates are commonly used for energy efficiency home improvement and construction, energy efficiency appliances, energy efficiency vehicles, and on-site renewable energy systems.
- **Grants** are normally provided by local governments, utilities and/or non-profit institutions. Grants commonly fund research and development, feasibility studies, system demonstration, installation, and operation, and/or business development. Through hybrid approaches, grants can also be combined with subsidized loans to support renewable energy and energy efficiency deployment.
- **Performance-based incentives** are often provided by utilities and funded through utility customer payments. Performance-based incentives commonly support renewable energy systems based on performance, and/or whole building energy efficiency upgrades based on overall energy saved. Hybrid rebate and performance-based incentives can also support

upfront investment and ongoing performance of renewable energy and energy efficiency systems.

Loan programs, guarantees, and credit enhancements can also be designed in various ways to support renewable energy and energy efficiency technology deployment. Selected examples of renewable energy and energy efficiency loan incentive programs and products are presented below.

- **Subsidized traditional revolving loans** reduce loan interest rates for energy efficiency and renewable energy technologies by providing a loan loss reserve fund or similar mechanism that serves as a form of insurance in the event of loan failure. Successful revolving loan funds are designed in such a way that the revenue from repaid loans (i.e., interest payments) covers net losses to the fund, and thus the fund can issue loans in perpetuity).
- **Mortgage-related loan programs** include property-assessed programs that provide funding for small-scale renewable energy systems and upfront energy efficiency improvements on a property that are paid back over time by commercial and residential property owners. Mortgage loans for energy efficient homes can also incorporate special loan terms (e.g., allowing higher debt to income and loan to value ratios) because the mortgages assume future energy savings for the homeowner.
- **Credit enhancements** reduce credit risk associated with renewable energy and energy efficiency investments through various mechanisms such as interest rate buy-downs and reserve accounts. **Loan guarantees** are common credit enhancement incentives that support reduced loan interest rates by providing assurance to a lender that loans will be fully or partially repaid in the event of borrower default.
- **Green banks** can provide loans and other incentives through public-private partnerships and innovative financing approaches, reducing the need for ongoing public funding. Green banks can “bundle” financial incentives to support various phases or aspects of energy efficiency and renewable energy deployment (e.g., grants could be used to support renewable energy business model development and loans could be used to support renewable energy technology installation and initial operation).

Policy Design and Good Practices

Key elements and good practices in designing financial incentives that have been drawn from global experience and can be tailored to meet country-specific goals are described below.

Design incentives to align with overall policy goals

While renewable energy and energy efficiency financial incentives often focus on supporting increased deployment of targeted technologies and practices, they can also be used to support other high-level goals. Examples might include spurring development of new industries, improving livelihoods in low-income communities through energy access and cost-savings, and expanding economic development more broadly. Goals may be defined through engagement of a diverse set of stakeholders from target markets and communities, the private sector, utilities, local government institutions, and others. Ensuring an incentive aligns with and is designed to achieve higher-level goals is an important first step (Lantz and Doris 2009). Text Box 2 highlights how Mauritius's grant program for solar water heating is aligned with higher-level national development goals.

Base incentive design on robust economic, financial, and market analysis

Incentive design is highly dependent on local markets and consumer preferences, availability of public sector resources, and broader financial infrastructure. Robust analysis should be pursued to inform target markets and technologies or actions to be incentivized, as well as potential impacts associated with the incentive. Importantly, by analyzing the local financial environment, the incentive can complement private sector finance initiatives that may be in place, rather than duplicate or replace these efforts. As an example, incentive programs might target lower-income communities with limited access to finance.

Because incentives are often specific to certain renewable energy and energy efficiency technology sizes, costs, and/or performance measures, robust technical and economic analysis of potential technologies can support successful incentive design. Further, incentives can be designed to support certain levels of technology market maturity and/or project development phases. As one example, geothermal projects face unique risks during the resource exploration phase that require design of specific incentives. Finally, in relation to project

Text Box 2. Solar Water Heating Grants in Mauritius Support Low-Income Households

To support renewable energy development in Mauritius, the Ministry of Renewable Energy and Public Utilities developed a policy to catalyze deployment of solar water heaters (SWH) through the provision of grants. To align with broader national development goals, in 2016 the program will target vulnerable and lower income households and communities to enable sustainable energy access. Clean Energy Solutions Center experts, through the "Ask an Expert" service, supported improvements to this next phase of SWH grant program through a market readiness assessment (Clean Energy Solutions Center 2015a).

One key lesson learned from the program involved the need for policy stability, system requirements, and robust analysis of appropriate incentive levels. Major interest when the program was launched in 2008, coupled with high incentive levels, led to a rush of projects before the program had fully established market capacity and system requirements to ensure high quality projects. However, since that time, improvements to the program have led to highly successful outcomes with over 90 MWh deployed through SWH and has led to significant cost savings and reduced emissions on the island.

Sources: Republic of Mauritius 2015; Epp 2010; Clean Energy Solutions Center 2015a

timeframes, while many programs incentivize technologies that produce very near-term cost savings (e.g., energy efficient appliances), technologies with longer implementation timeframes (e.g., renewable energy projects) can have significant overall benefits, enabled by financial incentives (EPA 2015).

Analysis of market size and structure, as well as available public sector resources, is critical to support development of realistic targets and goals for an incentive program. As such, policymakers can develop robust plans to fund incentive programs targeted at certain markets and aligned with available government budgets (EPA 2015). Incentive programs are often funded through taxes, electricity ratepayers, and/or incentive programmatic fees. Development banks and other donors also support incentive programs in a number of developing countries. Program funding mechanisms will be unique to individual country and jurisdictional circumstances. Policymakers can engage private and public stakeholders and civil society to consider funding approaches and ensure an inclusive dialogue related to potential benefits, costs, and social equity issues. After implementation of a financial incentive program, regular provision of transparent information on costs and benefits of the program can also allow for continued dialogue and improvements over time.

To stay within government budgets, plans may also incorporate maximum incentives or credit caps designed and implemented to avoid “boom and bust” scenarios, as described in more detail below (Wiser and Bolinger 2014; Cox et al. 2015a). Finally, evaluation of similar incentives and experiences in comparable country or jurisdictional contexts can inform strong incentive design aligned with desired impacts and targets (Lantz and Doris 2009).

Based on these analyses, policymakers can use the following key questions to inform financial incentive design and implementation in the context of unique jurisdictional circumstances.

- What are the fiscal implications of possible incentives over the near and long term for the public and private sectors and consumers?
- What current policies and programs may be a hindrance to incentive success (e.g., fossil fuel subsidies)?
- How can possible incentives add value to the market and avoid any possible market distortions?
- What opportunities exist for private partnership and/or investment to support incentive success?
- Which communities or populations might benefit most from certain incentives?
- How can consumer preferences inform incentive design to ensure success?
- What models and examples of successful financial incentive design and implementation exist domestically or globally that can be drawn from to inform effective program design?

Engage the private sector and finance community to add value to private investment and leverage and develop diverse pools of capital

Private sector engagement is crucial to inform design and implementation of financial incentives. To avoid crowding out private investment, financial incentives should add value to or address gaps and barriers associated with private investment. Effectively designed financial incentives benefit the market and avoid any potential impacts that could lead to market distortion (Walters et al. 2015; Bardouille et al. 2012). For example, governments can avoid providing one-off grants or subsidies

and instead design programs to send stable and appropriate market signals that add value to private sector efforts. Engaging the private sector can help policymakers understand market gaps, identify opportunities to support private investment and market development, and avoid market distortion. Strong public-private partnerships can also support a multiplier effect for public funds invested in renewable energy and energy efficiency. For instance, loan guarantees can attract large amounts of private capital while reducing public sector funding requirements. However, administrative costs to support loan guarantee programs are also an important consideration. Partnership with the private sector is critical to leverage investment to form diverse and large pools of capital for renewable energy and energy efficiency development. Text Box 3 describes a public-private partnership approach in Chile to catalyze renewable energy and energy efficiency investment.

Establish a stable policy environment and appropriate incentive timeframe to support sustained investment

Supporting market certainty by sending a longer-term policy signal can be critical to achieve successful financial incentive outcomes (EPA 2015; Lantz and Doris 2009; AWEA 2014). Often, financial incentive programs have 5- to 10-year timeframes (EPA 2015). Reductions in incentive levels over the period of the program should also be considered as the market develops and uptake of the technology or action increases. Phased approaches to incentive reductions support a stable policy environment, whereas abrupt expiration of financial incentive programs can stymie long-term investment. Regular monitoring and evaluation of program results can inform any potential changes to an incentive level. It is critical that transparent and easily accessible information is provided to industry and the private sector in relation to incentive changes via a public website and/or other mechanisms. In all cases, phased approaches for incentives should be designed and communicated at the start of an incentive program, rather than after the program is underway.

Text Box 3. Catalyzing Finance in Chile through Effective Design of Financial Incentives

To address key finance barriers to renewable energy and energy efficiency deployment in Chile, the Chilean Economic Development Agency (CORFO) implemented a concessional loan program to support commercial banks in providing low interest loans for renewable energy and energy efficiency technologies. The program was successful in catalyzing finance, with one third of Chilean banks now engaged in the provision of affordable financing for renewable energy and energy efficiency technologies and projects. A number of key enabling practices were instrumental to the program's success:

- The program was designed with a long term timeframe to support market development and engagement of key financial actors.
- CORFO and other partners strengthened the capacity of financial institutions and project developers to ensure effective implementation of the program.
- Permitting processes associated with renewable energy were streamlined.
- Broader community outreach and engagement built awareness of the program.

Building on this successful program and to further support finance mobilization in Chile, the Solutions Center supported the government of Chile in assessing the viability of publicly backed guarantees to manage commercial risk for renewable energy projects in an unregulated environment. Additionally, the Solutions Center provided best practices on engaging venture capitalists to finance renewable energy research and development projects.

Sources: UNFCCC 2015; Clean Energy Solutions Center 2015b

In cases where the goal of the incentive program is to support development of a new industry, incentive periods may be longer to ensure market development. Similarly, incentives focused on renewable energy projects with longer development timeframes, such as utility-scale projects, can also require longer incentive periods to ensure adequate participation of developers and investors. Incentives can also be provided in earlier stages of project construction to encourage more rapid renewable energy deployment. In these cases, complementary mechanisms to ensure project completion (e.g., requiring project ownership for a certain number of years) can also be put in place (Cox et al. 2015a; Wisner and Bolinger 2014; Shukla and Sawyer 2012; AWEA 2014).

Establish a robust policy foundation for financial incentives that will facilitate sustainable market development

Policies and regulations such as strong interconnection standards, renewable electricity standards, net metering policies, and feed-in tariffs, and actions such as streamlining renewable energy permitting processes, provide a critical foundation for success of financial incentives. Further, developing robust quality standards for renewable energy and energy efficiency technologies, supporting flexible business models, and training clean energy business and financial actors is integral in supporting development of a robust market that can thrive in the absence of financial incentives. In developing countries, there is also often a need for more targeted support of project developers to prepare projects for investment readiness. Such support can be provided through grants, loans, and mezzanine finance to provide a strong foundation for market development.

Closely coordinate incentive programs and/or bundle incentives to support policy efficiency

Complementary financial incentives can be developed under a broader renewable energy and energy efficiency market development strategy supported by a strong policy framework presented above. Many countries and jurisdictions offer diverse portfolios of grants, rebates, loans, and tax incentives targeted at various markets and technologies. Implementation of incentive programs and other policies can be closely coordinated or “bundled” to improve overall program and policy efficiency. Green banks (highlighted above) offer a mechanism to consolidate incentive programs under a single self-sustaining entity (not dependent on long term public finance), allowing for cost-savings and a streamlined administrative structure to support renewable energy and energy efficiency deployment (EPA 2015).

Expand outreach and build capacity to support market development and long-term finance

In many cases, there is a need to educate and build market awareness of the benefits of renewable energy and energy efficiency technologies and on the specific financial incentives offered. Well-designed outreach programs and educational events, often targeted at specific markets, can support positive financial incentive outcomes. In addition, ensuring that public guidance and procedures to participate in the program are easy to understand can improve participation levels. Finally, there is often a need to build capacity of various energy efficiency and renewable energy service providers to ensure sustainable outcomes. This could include building the capacity of organizations to inspect and certify technologies to meet certain performance standards, and technicians to install and maintain technologies, among others. Such training is particularly critical in supporting long-term incentive structures and performance-based incentives. In addition, certain financial products and programs, such as loan guarantees or subsidized loans, can be targeted to educate the financial sector on the value of clean energy markets (World Bank 2013; EPA 2015).

Monitor and evaluate benefits and costs and improve financial incentives over time

Financial incentive programs should have a robust plan in place to monitor energy savings and production, costs, market uptake, and other impacts. This information can be evaluated and used to inform potential changes to the level of incentive and improvements to the incentive program overall (Nelson and Pierpont 2013; EPA 2015).

Consider inclusion of non-taxable entities within tax incentive programs and other approaches to engage low-income individuals

Incentive programs can be designed to support non-taxable entities and poor non-tax burdened individuals in engaging with clean energy development. To ensure inclusion of non-taxable or limited tax liability entities such as non-profit organizations, schools, religious organizations, and municipal government and utilities in tax incentive programs, provisions can be made to allow tax equity provider partnerships and/or complementary incentives can be put in place to support engagement of those stakeholders (e.g., direct grants and other low cost finance mechanisms and subsidies). Further, third-party ownership of systems can allow private companies to provide the technologies and retain ownership to take advantage of tax benefits. Importantly, poor individuals without a tax burden are excluded from the benefits of tax incentives. This is a critical consideration and other incentives described in this paper, such as rebates, grants, and loan programs, can be designed to specifically target and benefit these individuals (Lantz and Doris 2009; Bipartisan Policy Center 2011; Cox et al. 2015b).

Conclusion

Financial incentives have been widely implemented to support renewable energy and energy efficiency market development globally. Learning continues to progress as countries design innovative measures to align with evolving renewable energy and energy efficiency markets. The key financial incentive design elements described in this brief provide a starting point for considering a country-specific and tailored financial incentive policy portfolio aligned with unique national circumstances and goals.

Text Box 4. Where can I Find More Detailed Information to Support Design of Specific Financial Incentives?

Building on the information in this policy brief and to support design and implementation of specific financial incentives, the Clean Energy Finance Solutions Center provides no-cost technical assistance and remote training to developing countries on instruments to mobilize investment. The Clean Energy Finance Solutions Center serves as a central resource for information on clean energy finance instruments, and it highlights the work of partner organizations and initiatives focused on catalyzing larger and lower-cost capital flows to accelerate clean energy deployment. To access resources and assistance, please visit finance.cleanenergysolutions.org.

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Appendix. Additional Support and Resources

Targeted technical assistance regarding the design and implementation of renewable energy policies is provided by:

- Clean Energy Solutions Center Ask an Expert—The Solutions Center Ask an Expert service is available at no cost to government agency representatives from any country and the technical institutes assisting them. If your request qualifies for assistance, you will be matched with the Solutions Center expert who is most qualified to help you, for up to 40 hours of assistance. For more information, see cleanenergysolutions.org/expert.
- Climate Technology Center & Network (CTCN)—Climate Technology Center & Network (CTCN)—The CTCN provides technical assistance in response to requests submitted by developing countries via their National Designated Entities (NDEs). Upon receipt of such requests, the CTC quickly mobilizes its global Network of climate technology experts to design and deliver a customized solution tailored to local needs. The CTCN does not provide funding directly to countries, but instead supports the provision of technical assistance provided by experts on specific climate technology sectors. For more information, see ctcn.org/technical-assistance.

Additional resources—including good practice resources and publications, policy examples and databases, webinars and training resources, and a glossary—are available at cleanenergysolutions.org/policy-briefs/financial-incentives/resources.