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# Subsidies or Free Markets to Promote Renewables?

Craig A. Hart and Dominic Marcellino\*

*OECD governments are reviewing government outlays to assess whether certain expenditures could be reduced or eliminated. Energy subsidies and other supports are among those areas being reviewed. While perverse energy subsidies should be eliminated, the authors argue that support for renewable energy remain a priority, both on climate change grounds, but also due to the market advantages fossil fuels enjoy vis-à-vis renewables. Policymakers have instruments at their disposal that promote renewables through the power of markets in the form of renewable portfolio standards and feed-in tariffs. The authors argue for the continued use of these instruments in the medium term.*

## I. Introduction

Pressure on governments in Europe and North America to reduce budget deficits has triggered a comprehensive review of spending measures. This review process has cast light on the wide variety of subsidies, implicit and explicit, that support the energy sector. Some are calling to end all forms of energy subsidies for energy and allow markets to decide the proper energy mix on an “even playing field”.

Standard economic theory holds that the elimination of all subsidies and supports in the energy sector should result in the prevalence of the least expensive sources of energy and the most efficient firms providing electricity, heat, and transportation fuels for consumers, as long as a number of assumptions hold, among them: perfect competition; all costs are internalized; there are no transaction costs; and consumers and producers have perfect information. Unfortunately, energy markets are not perfect markets and none of the assumptions postulated by economic theory hold in reality. Removing subsidies and other supports from all sources of energy will not establish an even playing field, as long as fossil and other established sources of energy (i.e. coal, oil, nuclear) retain the accumulated advantage of decades (over a century for fossil fuels) of public support in the form of subsidies, loans, guarantees, and various favorable laws and regulations. Even if subsidies were eliminated

tomorrow, these sources retain formidable advantages – fully developed infrastructures, allowing their ready availability within easy reach of every home, highway, and city street corner and favorable laws that allow the by-products of their consumption to be released into the environment without penalty in many countries – that would not readily disappear. The tremendous advantage they have gained from the failure to internalize the externalities of burning fossil fuels and the enduring head start they retain through technology and infrastructure lock-in cannot be undone by simply ending subsidies. Addressing climate change and giving renewable energy the support necessary to compete in the marketplace so that they someday become our primary source of energy without support remains the open challenge to governments. Simply ending subsidies would delay the transition to renewables, as they would still have to overcome the inherent advantages of established energy sources.

Despite need for subsidies in the near term, we are not advocating perpetual subsidies for renew-

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able energy production. Support for renewable energy must come to an end when these technologies can compete in a genuine free market, which means that today's dominant sources no longer are advantaged and that a truly "level playing field" is established. In the meanwhile, policies are available that harness the power of markets and promote competition in the energy sector and the adoption of renewables.

We investigate two of these policies: renewable energy portfolio standards (RPSs) and feed-in-tariffs (FITs). Importantly, they have helped renewable energy gain a significant foothold in energy markets. Nations across Europe have experience with one or both of these policies and a number of US States have implemented RPS policies over the past 15 years. While the level of ambition and details of these policies differ among jurisdictions that have adopted them, their implementation has resulted in the widespread installation of renewable energy systems across Europe and the US with minimal or no budgetary impact for governments.

This paper is divided into four sections. Section I argues to end "perverse" subsidies in energy markets. We judge certain subsidies to be harmful and others to be essential to achieving public goals where markets would fail to achieve these goals. In short, we support policies to promote renewable electricity. Implicit in our discussion is the idea that we are too far down the path of supporting the fossil fuel industry to "level the playing field" by removing the subsidies for renewable energy along with fossil fuels. Further, the challenges of climate change are too dire to completely avoid interventions that hasten the move to alternative energy. We then turn to two pro-market policies to speed the installation of renewables. Section II explores the potential of renewable portfolio standards and tradable renewable energy credits to harness market forces to deliver renewable energy. Section III looks at feed-in tariffs, which have been successfully used across Europe to promote renewable

systems, and which are now being adopted in countries and regions around the world. Section IV summarizes the arguments presented in the paper and concludes with a call to governments in Europe and the United States to continue supporting renewable energy through these and other policies, while eliminating perverse subsidies.

## II. A Balanced View of Subsidies

Subsidies confer an economic benefit on a business or industry. Examples of subsidies include: direct incentives, such as a cash transfer; indirect benefits, such as special tax treatment; relaxing regulation; trade protection; and consumption subsidies, to promote demand by consumers. Subsidies distort the functioning of markets by artificially lowering the cost of delivering a good or service.<sup>1</sup>

Subsidies can have negative or positive overall impacts. When subsidies promote the overuse of a commodity leading to scarcity of that commodity, pollution or other externalities, or over-dependence on a commodity, they are termed "perverse subsidies."<sup>2</sup> In the case of energy, when subsidies promote the development or adoption of more efficient, cleaner modes of production or diversification of the energy supply mix, then their effects are beneficial.

Fossil fuels receive various types of government subsidies that distort markets by lowering their cost of production and use, and thereby discourage the development and use of alternative, cleaner forms of energy. In general, subsidies for fossil fuels exacerbate environmental problems such as climate change, promote over-dependence on fossil fuels, and contribute to underinvestment in energy efficiency.<sup>3</sup> Fossil fuel subsidies include: tax benefits and grants to producers; consumer subsidies and sales tax exemptions; and uneven tax and trade treatment that discourage competition from alternative energy. Removing fossil fuel subsidies would be an important first step in properly valuing environmental commodities, addressing climate change, and removing market distortions that disadvantage clean technologies and promote the suboptimal use of resources.

Not only are fossil fuel subsidies harmful to the environment, but they also are costly to society. Fuel subsidies amount to an estimated \$409 billion worldwide, two-thirds of which occur in developing

1 ICTSD, *Tackling Perverse Subsidies in Agriculture, Fisheries and Energy*, Information Note (Geneva, Switzerland: International Centre for Trade and Sustainable Development 2012), at p. 9.

2 *Ibid.*, 2012.

3 McKinsey Global Institute, "Resource Revolution: Meeting the world's energy, materials, food, and water needs", November 2011, available on the Internet at <<http://tinyurl.com/c326jsn>> (last accessed on 25 November 2012).

countries, although per-capita levels are much higher in OECD countries.<sup>4</sup>

Subsidies for fossil fuel production and consumption should be distinguished from subsidies for the development of clean energy technologies for fossil fuels. Government programs to support fossil fuel research and development (R&D) to promote cleaner and more efficient fossil fuel production will remain important as long as coal and fossil fuels continue to play a significant part of global energy supply. Important technologies in this area include combined cycle power plants and carbon capture and sequestration technologies. The criteria for evaluating R&D funding should prioritize advanced technologies that have the potential to significantly decrease greenhouse gas emissions and other pollutants. At the same time, because the fossil fuel industry is mature, these support programs should be designed so that they transition their cost to the private sector and do not compete with funding for renewable energy technologies and related R&D.

III. Renewable Portfolio Standards and Renewable Energy Credit Markets

Under a renewable portfolio standard, the government or regulatory agency selects a level (usually measured in installed capacity or a percentage of total electricity production) of renewable electricity that must be generated on an annual basis by a target date. Some systems allow the standard to be met by electricity generated both within and outside the jurisdiction, and typically feature a trading market in order to achieve compliance. Renewable portfolio standards are often viewed as an alternative to a feed-in-tariff (described in Section III. below). While Germany, Denmark, and other countries implemented feed-in tariff systems, the UK, U.S. States, and the European Commission (for the EU as a whole) experimented with renewable portfolio standards (or RPS). However, some jurisdictions are considering implementing both policies together.<sup>5</sup>

Usually, RPS programs identify qualifying technologies, which typically include wind, solar, geothermal, and biomass – the more established renewable electricity technologies. For renewable energy generation, an RPS requirement generally requires the grid operator to grant interconnection

	OECD Countries	Non-OECD Countries	Total
Coal	30	23	53
Oil	19	33	52
Gas	8	38	46
Fossil Fuels	57	94	151
Electricity	–	48	48
Nuclear	16	Negligible	16
Renewable	9	Negligible	
Non-payments/bail-out		20	20
Total	82	162	244
Per capita (US\$)	88	35	44

Source: World Bank (2007a).<sup>6</sup>

Table 1: Fuel Subsidies in OECD and non-OECD Countries (US\$ Billions)

to the grid and to purchase electricity from renewable sources.

Many RPS laws allow generators to meet their obligations under an RPS through various means; including developing their own renewable generation projects; paying into a fund that supports the development of renewable energy; paying a penalty for non-compliance; or purchasing Renewable Energy Certificates (RECs) from another generator who produces renewable energy.

1. The U.S. experience with RPS systems

As of 2012, about two thirds of U.S. States had adopted RPS laws or voluntary policies.<sup>7</sup> State RPS programs vary widely in their design, differing by qualifying technologies, special minimum targets, awarding of additional credits for certain

4 International Energy Agency, World Energy Outlook 2011, (Paris: OECD/IEA 2011).  
5 Lincoln L. Davies, "Reconciling Renewable Portfolio Standards and Feed-In Tariffs", 32 Utah Environmental Law Review (2012), pp. 311–61.  
6 Notes: Subsidies for electricity countries have been attributed to fossil fuels according to their shares. Subsidies from nonpayment and bailout operations have not been attributed to energy sources.  
7 Energy Information Administration, "Most states have Renewable Portfolio Standards," available on the Internet at: < <http://www.eia.gov/todayinenergy/detail.cfm?id=4850>> (last accessed on 1 November 2012).

State	First Compliance Year	Current Ultimate Target	Set-Asides, Tiers, or Minimums	Credit Multipliers
Arizona	2001	15 % (2025)	Distributed Generation	None
California	2003	20 % (2010)	None	None
Colorado	2007	20 % (2020): IOUs 10 % (2020): POUs	Solar	In-State, Solar, Community-Ownership
Connecticut	2000	23 % (2020)	Class I/II Technologies	None
Delaware	2007	20 % (2019)	Solar, New/Existing	Solar, Fuel Cells, Wind
Hawaii	2005	20 % (2020)	Energy Efficiency	None
Illinois	2008	25 % (2025)	Wind	None
Iowa	1999	105 MW (1999)	None	None
Maine	2000	40 % (2017)	New/Existing	None
Maryland	2006	9.5 % (2022)	Solar, Class I/II Technologies	Wind, Methane
Massachusetts	2003	9 % (2014)	None	None
Minnesota	2002	25 % (2025) 30 % (2020): Xcel	Wind for Xcel; Goal for Community-Based Renewables	None
Montana	2008	15 % (2015)	Community Wind	None
Nevada	2003	20 % (2015)	Solar, Energy Efficiency	PV, DG, Eff, Waste Tire
New Hampshire	2008	23.8 % (2025)	Solar, New, Existing Biomass/ Methane, Existing Hydro	None
New Jersey	2001	22.5 % (2021)	Solar, Class I/II Technologies	None
New Mexico	2006	20 % (2020): IOUs 10 % (2020): Co-ops	Solar, Wind, Geothermal or Biomass, Distributed Generation	None
New York	2006	24 % (2013)	Distributed Generation	None
North Carolina	2010	12.5 % (2021): IOUs	Solar, Swine Waste, Poultry Waste, Energy Efficiency	None
Oregon	2011	25 % (2025): Large 5–10 % (2025): Small	Goal for Community-Based and Small-Scale Renewables	None
Pennsylvania	2001	8 % (2020)	Solar	None
Rhode Island	2007	16 % (2019)	New/Existing	None
Texas	2002	5,880 MW (2015)	Goal for Non-Wind	All Non-Wind
Washington	2012	15 % (2020)	None	Distributed Generation
Washington, DC	2007	11 % (2022)	Solar, Class I/II Technologies	Wind, Solar, Methane
Wisconsin	2000	10 % (2015)	None	None

Source: Wiser and Barbose (2008).

Table 2. Mandatory RPS Policies in Selected U.S. States

technologies and cost-containment measures, such as maximum penalties for non-compliance.<sup>8</sup> Table 2 describes selected RPS laws in the United States.

<sup>8</sup> Ryan Wiser and Galen Barbose, *Renewables Portfolio Standards in the United States: A Status Report with Data Through 2007*, (Berkeley: Lawrence Berkeley National Laboratory, 2008).

## 2. RPS systems linked to REC markets

Under an RPS linked to a trading system for renewable energy certificates, the owner of a facility receives a certificate for each proven unit (MWh) of electricity produced by renewables. These units are called by various names, including Renewable Energy Credits (RECs), Greentags, or Tradable

Renewable Certificates. The certificates or credits (the RECs) can be traded separately from the electricity and used by the buyer to meet their compliance obligations under a RPS. Similar to the efficiency gains from emissions trading systems to address global warming pollution, the gains from trade accrue in RPS systems from the production of electricity where it is least expensive, allowing regulated entities to become compliant with the RPS through the generation of lower cost renewable electricity, the acquisition of RECs, or some combination of both. Because electricity produced at renewable electricity facilities is sold to the grid, while the RECs are usually sold separately from the electricity to a separate buyer, geographically distant regulated entities can meet their RPS requirements, overcoming geographic barriers to renewable energy, including natural resources as well as differences in transmission and distribution systems.

The sale of RECs is designed to promote investment in renewable energy by providing an additional stream of revenue to renewable energy power generators. The extra stream of revenue can be used to make a project more robust financially and to allow renewable power developers to bid more competitively on the price of electricity to be provided under a power purchase agreement. To illustrate the value of RECs to a project, for a 100 MW wind project with a net capacity factor of 33%, and a REC price of \$10/MWh, the sale of RECs will increase pre-tax revenue by almost \$3 million per year ( $100 \text{ MW} \times 33\% \times 8,760 \text{ hours/year} \times \$10/\text{MWh}$ ).

Within the United States, prices for RECs vary widely from State to State, depending upon such factors as whether they are issued under an RPS and can be used for compliance purposes, the percentage of renewable power needed to meet the RPS requirement, the supply/demand of RECs in the State and the type of renewable resource that generated the REC. RECs are also commonly traded outside jurisdictions covered by RPS laws and regulations, in which case the credits are acquired on a purely voluntary basis; in these cases, the price for RECs are generally lower than in regulated areas. Prices are highly volatile and have ranged from a few dollars to over \$250 per MWh in certain cases.<sup>9</sup>

## IV. Feed-In Tariffs

### 1. Background

Feed-in-tariffs are one of the most widely-used market-oriented measures for promoting the adoption of renewable electricity. Though the precise design differs from jurisdiction to jurisdiction, the basic components of feed-in tariffs are well established. A feed-in tariff establishes a fixed rate of compensation for the production of electricity from renewable energy sources. This rate usually varies by the size of installation, the type of technology used, and sometimes also by the resource potential in the geographic area where the system is installed. This rate of payment promotes installation by being above the wholesale and usually the retail price of electricity. The rate is contractually agreed to over a period of time – as long as 20 years in some cases. By ensuring a commercial price for electricity generated by a project, lenders are able to extend loans at attractive interest rates.

Two other features support many feed-in tariff policy structures. The first feature is guaranteeing renewable energy projects access to the electricity grid. The second is ranking that renewable electricity is first in the merit dispatch order. The German system, for example, features both policies. In short, when renewable electricity is produced, the grid operator uses renewable electricity first to meet demand, then meets the rest of the demand curve with supply from other sources of electricity – coal, natural gas, nuclear.

In most cases, the system owner is paid a fixed rate for electricity produced and fed into the grid, regardless of how much electricity is consumed by the facility itself (the accounts for production and consumption are kept separate). This feature has proven especially important for promoting the installation of renewable energy systems in residential settings. This feature distinguishes many feed-in tariffs from the net metering system used in the United States and other countries in which an owner of a renewable energy installation is paid only for surplus generated electricity on site, usually at wholesale rates. The key dynamic for encouraging renewable energy installation is the much higher (above retail electricity rates) rate of

<sup>9</sup> *Ibid.*, 2008, at p. 26 *et seq.*

remuneration. The source of funding for the feed-in tariff payments also varies by jurisdiction. Some systems (like Spain) relied on general tax revenue to fund the feed-in tariffs, whereas others (like Germany) finance the feed-in-tariff by passing the cost of electricity to consumers through billing.<sup>10</sup> In light of public budget difficulties in recent years, the latter model has proven more stable.

As a result of these features, feed-in tariffs provide renewable projects with a predictable stream of revenues and address the risks of market fluctuations in the prices of energy. Feed-in-tariffs are one of the most powerful policy tools available for promoting the adoption of renewable energy. At the same time, it enables policymakers to calibrate incentives based on changing market and technological factors, and to spread the cost of renewable energy over a broad rate base. Feed-in tariffs can be periodically re-adjusted to reflect the changing economics of developing projects. As a result of these various features, feed-in-tariffs have proven highly effective in both increasing the penetration of renewable energy, but also in creating jobs in countries that adopt these policies.<sup>11</sup> The predictability of the revenue stream greatly reduces the risk associated with renewable projects and enables firms to plan and expand.

2. Case study: the German Renewable Energy Sources Act

The German Renewable Energy Sources Act, which was first adopted in 2000 and has subsequently been revised several times, provides an example of how a well developed feed-in-tariff works. The law provides that qualifying renewable electricity generated will be sold via the local grid system operator to the regional transmission organization/ transmission system operator at a guaranteed price for a period of years set by a government committee.<sup>12</sup> The guaranteed price and term is calibrated to insure repayment of capital expenditures, debt and a market return on the capital investment. A period of 20 to 25 years is typical, but shorter periods of price guarantees have been considered in recent years. Electricity from different renewable technologies is sold at different guaranteed prices based on the economics of the particular technology at the time of construction of the project (for examples of rates by size and technology, see Table 3 below). The Federal Ministry for the Environment, in coordination with the Federal Ministry of Food, Agriculture and Consumer Protection and the Federal Ministry of Economics, periodically adjust (usually downward) guaranteed prices for new projects based on improvements in renewable tech-

	Duration Years	2007 €-Cents/kWh	2009 €-Cents/kWh	2012 €-Cents/kWh
Hydropower	30	3.58–9.67	3.50–12.67	3.40–12.70
Biomass	20	8.15–20.99	3.62–13.67 + bonuses	6–14.30
Geothermal	20	7.16–15	7.16 – 16 + bonuses	25.00 + bonuses
Onshore Wind	20	5.17–8.19	5.02–9.20	4.87–8.93
Offshore Wind	20	6.19–9.10	3.50 – 15	15 – 19
Photovoltaic	20	40.6- 56.8	31.94–43.01	13.10–18.92

Table 3. : German Renewable Energy Sources Act, Selected Feed-In Rates<sup>13</sup>

10 Renewables International, “Spanish moratorium on renewable power”, available on the Internet at <<http://tinyurl.com/cebnyze>> (last accessed 25 November 2012).

11 German Federal Environment Ministry, “Entwicklung der erneuerbaren Energien in Deutschland im Jahr 2011”, available on the Internet at <<http://tinyurl.com/87b39bh>> (last accessed 25 November 2012).

12 German Erneurbare-Energie-Gesetz, Bundesgesetzblatt 2012, Teil I, Nr. 38, Seite 1754, available on the Internet at <<http://tinyurl.com/atlydkv>> (last accessed 25 November 2012).

13 Sources: Christine Woerlen, “The Past and Future Impact of Germany’s Renewable Energy Sources Act”, presentation held at the event “Climate change and the future of U.S. and EU energy policy”, Washington, DC 27 August 2007; German Energy Blog, “German Feed-in Tariffs 2012”, available on the Internet at: <[http://germanenergyblog.de/?page\\_id=8617](http://germanenergyblog.de/?page_id=8617)> (last accessed 7 September 2012); Paul Gipe, (2009) *Tables of Renewable Tariffs or Feed-In-Tariffs Worldwide*, available on the Internet at: <<http://tinyurl.com/6qkzrh>> (last accessed 25 November 2012).

nologies, in order to capture cost reductions for the benefit of consumers. The costs of renewable electricity are spread among the consumer base by the regional transmission utility, which charges a uniform price for all electricity.

The feed-in tariff should be designed to provide ample, but not excessive, profit.<sup>14</sup> This properly compensates investors and minimizes the cost to consumers. In this respect, feed-in tariffs function similarly to standard methods of recovering capital cost outlays in regulated electricity markets in the

United States and other countries. As mentioned above, the feed-in tariff rate can be differentiated based on the size of installation and the quality of natural resources available to the project. In the case of wind, for example, the German feed-in tariff provides higher payments for inland wind projects than those in coastal regions, where the wind resource is better – differentiating the payments not only based on technology, but also on location-specific natural resources. Differentiation by resource availability promotes more evenly distrib-

	Hydro-Power	Wind Energy	Biomass	Biogenic fraction of waste	Solar PV	Geothermal energy	Total capacity	Share of gross electricity consumption
	MW	MW	MW	MW	MW	MW	MW	%
1990	3,429	55	85	1,213	1	0	4,069	3.1
1991	3,394	106	96	1,211	2	0	4,097	3.1
1992	3,550	174	105	1,262	3	0	4,331	3.7
1993	3,509	326	144	1,203	5	0	4,483	3.9
1994	3,563	618	178	1,306	6	0	4,865	4.2
1995	3,595	1,121	215	1,348	8	0	5,464	4.5
1996	3,510	1,549	253	1,343	11	0	5,874	4.1
1997	3,525	2,089	318	1,397	18	0	6,476	4.3
1998	3,601	2,877	432	1,618	23	0	7,473	4.7
1999	3,523	4,435	467	1,740	32	0	9,012	5.4
2000	4,538	6,097	579	1,844	76	0	10,875	6.8
2001	3,538	8,750	696	1,859	186	0	13,755	6.7
2002	3,785	11,989	843	1,949	296	0	17,498	7.8
2003	3,934	14,604	1,091	2,161	435	0	20,911	7.5
2004	3,819	16,623	1,444	2,117	1,105	0.2	24,007	9.2
2005	4,115	18,390	1,964	3,047	2,056	0.2	27,735	10.1
2006	4,083	20,579	2,620	3,844	2,899	0.2	31,431	11.6
2007	4,169	22,194	3,434	4,521	4,170	3.2	35,300	14.3
2008	4,138	23,826	3,969	4,659	6,120	3.2	39,497	15.1
2009	4,151	25,703	4,519	4,352	10,566	7.5	46,497	16.4
2010	4,395	27,191	5,014	4,781	17,554	7.5	55,812	17.1
2011	4,401	29,071	5,479	4,950	20,039	7.5	65,698	20.3

Table 4: Germany Renewable Energy Electricity Generation Capacity, 1990–2011<sup>15</sup>

<sup>14</sup> The infrequent updating of rates, whereby they do not reflect technological change, are one way that system owners earn out-size profits. In many cases, changes to the law and regulations have addressed this issue.

<sup>16</sup> Source: German Environment, “Entwicklung”, supra note 12.

uted generation, avoids the clustering of wind projects in a limited number of locations and helps preserve the aesthetics of the German countryside. Tables 3 and 4 portray the evolution of feed-in tariffs for various technologies in Germany and the development of renewable energy generation capacity from 1990 to 2011 respectively.

Germany has undertaken several revisions of its feed-in tariff law, including adjusting tariffs upward to promote small-scale electricity generation from renewable sources and also a series of downward adjustments, especially for solar PV installations, to reflect rapid changes in technology and installation costs. It continues to adjust pricing annually (and even more often than that) to reflect technology and market conditions. Provisions were added to prevent various types of abuse of the tariff system: one common strategy to extract higher rates was for project developers to structure large projects as multiple smaller generation facilities in order to earn the higher tariff rates available for small generation. The subsequent revisions of the law have provided further guidance on allocating costs of grid extensions between the grid operator and renewable energy project developers. Grid operators are required to pay for (most) interconnection costs, the cost of which is then passed on to the rate base by including these costs in the total contribution for the feed-in tariff. Where interconnection requires an extension of the grid, the cost is born by the grid operator, if economically feasible. These provisions are particularly important for biomass, solar, and offshore wind, as these tend to be more geographically disbursed and involve greater costs for interconnection depending upon the size of the plants.

The German law has produced remarkable results, placing Germany at the forefront of renewable technology development, consumption and job creation. The law is helping drive down the cost of renewable energy technologies, especially wind and solar. Increases in wind, solar, biomass and biogas as a result of the law enabled the German government to exceed their renewable energy target of 12.5 % of electricity produced by renewable technology by 2010 ahead of schedule, and they are now on their way to achieving a new goal of at least

30 % by 2020. The law has helped produce over 381,000 new jobs in the renewable sector by 2011.<sup>16</sup>

## V. Conclusion

The on-going fiscal and budgetary challenges faced by many OECD countries necessitate the consideration of policies and measures that can encourage the continued adoption of renewable energy technologies without increasing or, where possible, reducing budgetary outlays.

Advocates of free energy markets are proposing the elimination of the estimated \$409 billion per year in subsidies for fossil fuels. We agree that perverse energy subsidies – which benefit technologies that pollute the environment or perpetuate energy dependence – should be eliminated and the sooner the better. And while we recognize that eliminating energy subsidies would decrease market distortions and would likely lead to decreased energy use overall, it would not level the playing field in light of the accumulated advantage enjoyed by traditional energy sources. Rather, it would slow the penetration of renewables in their steady progress in displacing traditional sources of energy that damage the environment.

We think the best argument for continuing to support renewable energy is the results these policies have achieved. Every year, renewable energy technologies have increased their market penetration and have become less expensive. For example, with the support of FITs in Germany, renewables increased from 6.8 % of electricity consumption in 2000 to 20.3 % in 2011. RPSs have been similarly successful in the US in jumpstarting the installation of renewables. The adoption of renewables enabled through these and other policies has produced cleaner air and reduced greenhouse gas emissions.

We think that the case for eliminating subsidies for traditional sources of energy is much stronger. In contrast to renewables, subsidies for fossil fuels perpetuate the use of technologies that already enjoy considerable market advantages. Imperative to achieving a leveling of the playing field is requiring fossil fuel producers to bear the full cost of externalities, particularly air pollution and greenhouse gas emissions. Ending subsidies to fossil

<sup>16</sup> *Ibid.*, 2012.

fuel producers would therefore represent only an important first step.

We argue that policymakers should examine the full suite of policy options, selecting from those that achieve the goal of promoting renewable energy (and contributing to the mitigation of greenhouse gas emissions), while keeping governmental budget outlays to a minimum and harnessing the power of markets. Renewable portfolio standards and feed-in tariffs meet these requirements, and governments in Europe and the US already have substantial experience with them. These are pro-market policies. Both policies rely on supply and demand fundamentals for valuing services and have delivered economic co-benefits, including spurring the growth of the renewable industry,

creating jobs in the countries that have adopted them, and lowering the cost of renewable energy. And, where a RPS is coupled with RECs, this policy creates entirely new markets.

While governments in Europe and the United States must address budgetary and financial challenges, a sound approach to energy policy would eliminate perverse subsidies and internalize the full costs of fossil fuels. At the same time, governments should continue to support renewables using RPS and FIT policies, which have little or no budgetary impact. In doing so, governments in the US and Europe can hasten the adoption of renewables, combat climate change, and also move the energy sector closer to the day when all subsidies can be eliminated.