TRADABLE GREEN CERTIFICATE SYSTEMS IN THE E.U.*

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I. INTRODUCTION

Three main goals are at the core of the European Union (E.U.) energy policy of the last decade: firstly, liberalisation of national electricity markets,[1] to the end of lowering energy prices for consumers; secondly, fulfillment of the E.U. commitment under the Kyoto protocol,[2] concerning an 8% reduction of greenhouse gas (GHG) emissions by 2012 compared to the 1990 scenario; thirdly, "greening" of the energy markets to be attained by doubling the E.U. share of Renewable Energy (RE)[3] supplies in gross inland energy consumption by 2010.[4] In particular, to the end of promoting Renewable Energy Sourced Electricity (RES-E), the E.U. Council Directive 01/77/EC ascribes Member States[5] indicative targets (see Table 1 below)[6] for RES-E penetration and requires Members to

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1. *See* Council Directive 03/54/EC, 2003 O.J. (L 176) 37 (concerning common rules for the internal market in electricity and repealing Council Directive 96/92/EC, 1997 O.J. (L 27) 20).

2. The Kyoto Protocol to the United Nations Framework on Climate Change (UNFCCC) was adopted in Kyoto, Japan on 11 December 1997. *See* Framework Convention on Climate Change, June 4, 1992, S. Treaty Doc. No. 102-38 (1992), 31 I.L.M. 849, *available at* http://unfccc.int/resource/convkp.html; Kyoto Protocol to the United Nations Convention on Climate Change, Dec. 10, 1997, 37 I.L.M. 22, *available at* http://unfccc.int/resource/country/index.html.

3. The following acronyms and terms are used throughout this paper: RE: renewable energy; RES: renewable energy sources; RES-E: electricity from renewable energy sources; MWh: megawatt/hour. In some cases, the term renewable energy should be interpreted in a narrower sense as electricity from renewable sources.

4. *See* Council Directive 01/77/EC, 2001 O.J. (L 283) 33 (promoting electricity produced from renewable energy sources in the internal electricity market) [hereinafter Council Directive 2001/77/EC]. The Directive aims at promoting RES-E penetration, as well as social and economic cohesion. *See id.*, pmbl., § 2. *See also* COMM'N OF THE EUROPEAN CMTYS., ENERGY FOR THE FUTURE: RENEWABLE SOURCES OF ENERGY, WHITE PAPER FOR A COMMUNITY STRATEGY AND ACTION PLAN (1997), *available at* http://europa.eu.int/comm/energy/library/599fi_en.pdf.

5. More precisely, the Annex to Council Directive 01/77/EC does not include objectives for the ten Member States from Central and Eastern Europe (CEE) – i.e. Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, and Slovenia – which joined the E.U. in May 2004. *See* Council Directive 01/77/EC, *supra* note 4, at Annex. CEE countries are indeed subject to the requirements of the aforementioned Directive, but their national indicative targets for RES-E consumption are set out in the Accession Treaty. *See* COMM'N OF THE EUROPEAN CMTYS., COMMUNICATION FROM THE COMMISSION TO THE COUNCIL AND THE EUROPEAN PARLIAMENT, THE SHARE OF RENEWABLE ENERGY IN THE E.U. 11 (2004), *available at* http://europa.eu.int/comm/energy/res/legislation/doc/country_profiles/com_2004_366_en.pdf [hereinafter COMM'N OF THE EUROPEAN CMTYS.].

6. It is worth noting that the Annex to Council Directive 01/77/EC lists only "reference values," i.e. targets that are used by Member States for the fixing of national indicative targets but that are not binding in

fulfill such objectives by 2010 in accordance with market liberalisation principles as prescribed by the E.U. Council Directive 03/54/EC.

Gaining cost-efficient deployment of Renewable Energy Sources and meeting environmental goals in a liberalising energy market do not promise to be easy tasks.[7] Green certificate trading is deemed a market-conforming instrument,[8] which favours RE penetration by stimulating demand for "green" (i.e. renewable) energy, and which indirectly contributes to a decrease in GHG emissions.

As a result, a number of E.U. countries are already implementing or planning a Tradable Green Certificate (TGC) system to increase the domestic share of RE production. National TGC designs, however, differ significantly. The purpose of this paper is to describe selected national TGC experiences within the E.U. by paying particular attention to the differences among national schemes challenging the establishment of an integrated and efficient European TGC system.

This paper is structured as follows: Section two provides an overview of the TGC mechanism by describing the main features of such a policy tool and pointing out the greatest advantages in setting up an international TGC system. Section three outlines major discrepancies and potential conflicts among existing and planned national TGC systems, whereas section four describes ongoing experience within the E.U. Finally, section five summarises the main conclusions of this paper.

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7. *See, e.g.*, Stine Grenaa Jensen & Klaus Skytte, *Simultaneous Attainment of Energy Goals by Means of Green Certificates and Emission Permits*, 31 ENERGY POL'Y 1, 64 (2003). The authors point out the difficulty of achieving energy, environmental, and market liberalisation goals in a case where regulatory instruments affect each other and thereby the attainment of the specified goals. *See also* P.E. Morthorst, *National Environmental Targets and International Emission Reduction Instruments*, 31 ENERGY POL'Y 1, 73–83 (2003) (underlining the need for national co-ordination when combining a green certificate system with a tradable CO_2 permit market). Morthorst contends that when green power production is increased nation-wise, tradable permits quotas should be decreased correspondingly; otherwise the expected CO_2 reduction will not contribute by the full value to the achievement of national targets for greenhouse gas reduction. *Id.*

8. *See* G.J. SCHAEFFER ET AL., ENERGY RESEARCH CTR. OF THE NETH., THE IMPLICATIONS OF TRADABLE GREEN CERTIFICATES FOR THE DEPLOYMENT OF RENEWABLE ELECTRICITY: MID-TERM REPORT 5 (Oct. 1999), *available at* http://www.ecn.nl/docs/library/report/1999/c99072.pdf. *See also* E.J.W. VAN SAMBEEK & E. VAN THUIJL, ENERGY RESEARCH CTR. OF THE NETH., THE DUTCH RENEWABLE ELECTRICITY MARKET IN 2003 23 (2003), *available at* http://www.ecn.nl/docs/library/report/2003/c03037.pdf (stating,"[G]reen certificate markets hardly interfere with the electricity market and are[,] therefore[,] more compatible with electricity market liberalisation. Green certificates also provide a mechanism for international trade of renewable electricity and thereby facilitate the creation of an internal market for renewable electricity in the EU.").

Table 1: Indicative Targets for the E.U.-Fifteen Member States' RES-E Gross Consumption by 2010, Pursuant to the Annex to the E.U. Directive 2001/77/EC

Austria	78.1 %
Sweden	60.0 %
Portugal	39.0 %
Finland	31.5 %
Spain	29.4 %
Italy	25.0 %
France	21.0 %
Denmark	29.0 %
Greece	20.1 %
Germany	12.5 %
Ireland	13.2 %
Netherlands	9.0 %
Luxembourg	5.7 %
UK	10.0 %
Belgium	6.0 %
Overall E.U.-15	22.1 %

II. TRADABLE GREEN CERTIFICATE (TGC) OVERVIEW

TGCs are tradable financial assets issued to producers of certified "green" electricity on the basis of the units of "clean" energy generated. In combination with a purchase quota obligation, they can be used as a policy tool to promote RES-E growth.

Since renewables cannot compete under pure market conditions with conventional power, a separate market is established where certificates – representing only the "greenness" of power production – as opposed to physical energy – can be traded. Although in some TGC systems demand for certificates is voluntary in nature,[9] most TGC schemes require specific market actors (producers,

9. *See* G.J. SCHAEFFER ET AL., ENERGY RESEARCH CTR. OF THE NETH., OPTIONS FOR DESIGN OF TRADABLE GREEN CERTIFICATE SYSTEMS 16 (2000), *available at* http://www.ecn.nl/docs/library/report/2000/c00032.pdf (stating that "demand for [TGCs]" can be either created

suppliers, or consumers) to purchase a number of certificates matching a certain quota of their production, distribution, or consumption of "conventional" energy. In other words, certificate demand results from a politically determined target for RES-E penetration, which is transferred to a specific group as an obligation to buy certificates.

Certificate supply, by contrast, derives from the selling of certificates by RES-E producers. Through such sales, RES-E producers can realise additional revenues compensating them for the lower competitiveness of RES compared to conventional energy sources, as well as for the environmental benefits they provide.[10]

TGCs' proponents list a number of arguments for why such a policy instrument should be preferred to other RE promotional tools.[11] First and fore-

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by enlightened electricity customers buying "green power," or it can be determined by "1. an obligation on [market] actor[s] . . . 2.. . . . a fixed price at which certificates can be sold . . . 3. a tendering process . . . .").
TGC mechanisms with mandatory demand tend to ensure a more stable growth of renewables as well as greater conformity to the "polluter pays principle" than mechanisms based on voluntary demand for certificates. Until January 2004, a TGC system with voluntary demand was implemented in the Netherlands. Indeed, Dutch consumers were encouraged to purchase RES-E through fiscal incentives, notably a reduction on the eco tax. However, in July 2003, a new RES-E support scheme (MEP) replaced the then existing TGC scheme with a feed-in system because the previous favourable fiscal incentives had caused a substantial loss in tax revenues and also generated considerable RES-E import to the Netherlands, without stimulating additional investments domestically or abroad. *See also* E.J.W. VAN SAMBEEK & E. VAN THUIJL, ENERGY RESEARCH CTR. OF THE NETH., THE DUTCH RENEWABLE ELECTRICITY MARKET IN 2003 5 (2003).

10. *See* P.E. Morthorst, The Development of a Green Certificate Market, 28 ENERGY POL'Y 1081, 1088 (2000). *See also* Reinhard Madlener & Roger Fouquet, Markets for Tradable Renewable Electricity Certificates: Dutch Experience and British Prospects 2 (Aug. 1999) (unpublished manuscript, *available at* http://www.cepe.ethz.ch/download/staff/reinhard/madfouq_oxford1999.pdf). Among the positive "externalities" of TGCs, Madlener and Fouquet include:

> public environmental benefits (such as reduction of air pollution and greenhouse gas emissions) compared to other forms of electricity generation; research and development of new technologies; reductions in fuel prices (by reducing the demand for and dependency on certain fuels); and, possible reductions in the costs to the electricity network from decentralised generation.

Id. at 2.

11. Three main policy tools are currently used in the E.U.: feed-in tariffs, tender models, and TGCs. *See* Isabel Kühn, New Competition-based Support Schemes for Electricity Generation from Renewable Energy Source 2–4 (Sept. 1999) (unpublished manuscript, *available at* ftp://ftp.zew.de/pub/zew-docs/umwelt/CZ_paper3.pdf). *See also* G.J. SCHAEFFER ET AL., ENERGY RESEARCH CTR. FOR THE NETH., TRADABLE GREEN CERTIFICATES: A NEW MARKET-BASED INCENTIVE SCHEME FOR RENEWABLE ENERGY: INTRODUCTION AND ANALYSIS (1999), *available at* http://www.ecn.nl/docs/library/report/1999/i99004.pdf (stating that feed-in tariffs can be regarded as subsidies on renewable energy output). Under feed-in tariff schemes, long-term minimum prices are guaranteed for RES-E, and utilities are obliged to buy it. Although in Denmark, Germany, and Spain, feed-in systems have proven very effective in installing new RE capacities, such a policy measure does not conform to the principle of market competition nor does it spur innovation. Moreover, feed-in tariffs may inflict large costs on the authorities as renewable generation grows. *See* KLAUS VOGSTAD ET AL., NORWEGIAN UNIV. OF SCI. & TECH., TRADABLE GREEN CERTIFICATES: THE DYNAMICS OF COUPLED ELECTRICITY MARKETS 2 (n.d.), *available at* http://www.stud.ntnu.no/~klausv/publications/TGC2003.pdf (last visited Jan. 15, 2005).
As an alternative to TGCs and feed-in tariffs, several E.U. countries support RES-E by means of *bidding systems*. Under such schemes, tenders are invited by a public body to compete either for a certain financial budget or a certain capacity of RES-E generation. In each bidding round the most cost-effective offers will be selected to receive subsidy. As a result, bidding systems promote strong competition between investors in new plants as well as innovation. However, this policy tool could present the disadvantage of excluding small investors –

most, they ensure the highest coherence with market principles when compared with alternative measures.[12] Indeed, although current TGC systems are not purely market based – since demand for certificates is determined by governments' requirements – they allow renewables to gradually merge into conventional energy markets. At the time being, policies supporting clean energy sources are indeed essential to avoid that the ongoing liberalisation process of the E.U. energy market ends up frustrating the development of "green" energy. However, in the long run, TGCs are expected to bring renewables to the level of maturity necessary to compete with conventional energy.[13]

If combined with quota obligations and penalties, TGCs are likely to be very effective in achieving RES-E targets, because they allow obliged parties to comply with their obligation in a flexible manner, which is by purchasing certificates instead of buying or producing RES-E themselves.[14] Moreover, TGC schemes are cost-efficient in nature because they tend to stimulate competition between producers, thus leading to a reduction of RE generation costs.[15] TGC systems can also be considered quite transparent RE promotional measures because they allow monitoring production, consumption, and pricing of "green" energy.[16]Finally, TGCs determine quite a fair distribution of costs and benefits among market parties, as required by the equity principle.[17]

By contrast, the main shortcomings of TGC models are unfair competition

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who might be unable to deal with this pressure – and favour big industrial projects, which are likely to dominate the awarded contracts. Moreover, an unsteady tendering process could lead to unsteady investment in RES-E plants. *See* G.J. SCHAEFFER ET AL., ENERGY RESEARCH CTR. OF THE NETH., THE IMPLICATIONS OF TRADABLE GREEN CERTIFICATES FOR THE DEPLOYMENT OF RENEWABLE ELECTRICITY: MID-TERM REPORT 38 (1999).

12. *See* ISABEL KÜHN ET AL., RENEWABLE ELECTRICITY & LIBERALISING MARKETS, WORKING GROUP III: HOW TO IMPROVE THE FRAMEWORK AND DESIGN OF NATIONAL POLICIES FOR THE PROMOTION OF RENEWABLE ELECTRICITY: OBSERVATIONS OF GERMANY, THE NETHERLANDS, AND THE U.K.: FINAL PAPER 21 (1999), *available at* ftp://ftp.zew.de/pub/zew-docs/umwelt/WG3final1.pdf. However, some authors maintain that TGCs are not more compatible with market principles than feed-in tariff models. *See* N.I. Meyer, *European Schemes for Promoting Renewables in Liberalised Markets*, 31 ENERGY POL'Y 579, 673 (2003) (contending that the TGC approach is only partly consistent with the principles of a deregulated market because the quantity (or quota) of demanded RE is determined by governments and not by market forces). According to the same author, since feed-in and TGC systems combine market features with regulation, they can be both considered "pseudo-market" mechanisms, and thus deciding which tool is more in accordance with a deregulated market "is just a matter of taste." *Id. See also* ENERGY FOR SUSTAINABLE DEV., LTD., THE EUROPEAN RENEWABLE CERTIFICATE TRADING PROJECT (RECERT), FINAL TECHNICAL REPORT 26 (2001), *available at* http://recert.energyprojects.net/ [hereinafter RECERT].

13. *See* A.L. VAN DIJK ET AL., ENERGY RESEARCH CTR. OF THE NETH., RENEWABLE ENERGY POLICIES AND MARKET DEVELOPMENTS 5 (2003), *available at* http://www.ecn.nl/docs/library/report/2003/c03029.pdf.

14. *See* Isabel Kühn, New Competition-based Support Scheme for Electricity Generation from Renewable Energy Source 4 (Sept. 1999) (unpublished manuscript, *available at* ftp://ftp.zew.de/pub/zew-docs/umwelt/CZ_paper3.pdf) (pointing out that TGCs represent a very flexible policy tool because they might be more easily extended to other energy sectors or merged with the European bubble approach to CO_2 reductions and emissions trading).

15. *See* VAN DIJK ET AL., *supra* note 13, at 28. *See also* RECERT, *supra* note 12, at 24. The last document points out that although experience with TGCs is very limited at the moment, TGCs have the potential to be a very effective and cost-efficient policy tool.

16. *See* VAN DIJK ET AL., *supra* note 13, at 31.

17. *See id.*

among technologies at different stages of development and uncertainty for potential investors in RES.[18] Indeed, in TGC markets, less competitive types of RE, such as photovoltaic and wave energy, are usually unable to compete against cheaper alternatives like wind and biomass energy, and thus certificate trading does not favour long-term promotion of total RE potential. As a result, some TGC systems may exclude more competitive clean technologies from certification or force obliged parties to fulfill their quotas with green certificates coming from different kinds of RES.[19] The second shortcoming of TGC systems, that is investors' uncertainty,[20] is due to certificate price volatility, which is in turn determined by the combination between inelastic demand for TGCs – as resulting from quotas – and considerable fluctuations in green electricity production.[21]

A number of options could be used to increase stability of certificate markets: granting eternal validity to such titles or allowing their banking[22] and/or "borrowing,"[23] for instance, would prevent surges in certificate price by making demand for them more elastic. Authorities could also retain the power to waive or reduce obligations against unforeseen circumstances,[24] but this arrangement could also deter RES investments by creating market uncertainty. Alternatively,

18. It is worth noting that the 22% objective set out in the Council Directive 01/77/EC does not detail the penetration of the different sources of RES-E, and thus Member States are responsible for specifying the mix of renewables.

19. *See, e.g.*, Niels I. Meyer, Comparison of Models for Promoting Renewable Energy in a Liberalised Market 13–14 (June 2002) (unpublished manuscript, *available at* http://www.world-council-for-renewable-energy.org/downloads/WCRE-Meyer.pdf) (suggesting that problems related to market competition between technologies at different stages of development could be reduced by combining certificates models with a centralized tender model).

20. For an in depth analysis of financial risks for "green" electricity investors and producers in a TGC market, see Jacob Lemming, *Financial Risks for Green Electricity Investors and Producers in a Tradable Green Certificate Market*, 31 ENERGY POL'Y 1, 21–32 (2003).

21. Certificate price volatility could also be determined by "mistakes" in long-term determination of demand quotas: hence, policy makers should take into account all the factors affecting certificate supply – such as the time needed to build new capacity (usually from two to four years) – in order to decrease certificate price volatility. *See* Morthorst, *supra* note 10, at 1093.

22. "Banking" would enable market actors to store excess of certificates and use it in future redemption periods, against sharp certificate price hikes due to possible deficits or irregularities on the supply side. However, as a side effect, banking could allow strategic behaviour that could cause even more harmful price fluctuations followed by price crashes. Thus – according to some scholars – only limited banking could reduce such undesirable instability. *See, e.g.*, Klaus Vogstad, Designing Market-Oriented Environmental Policy Instruments: The Case of Tradable Green Certificates 4 (2003) (unpublished manuscript, *available at* http://www.stud.ntnu.no/~klausv/publications/Petten2003.pdf).

23. "Borrowing means that TGC obligations can be postponed into the future by buying more certificates later on." *Id.* at 2. Borrowing is usually not considered an acceptable option because it raises the need for further regulation – for instance on possible penalties – to ensure compliance. *See* KLAUS VOGSTAD ET AL., NORWEGIAN UNIV. OF SCI. & TECH., TRADABLE GREEN CERTIFICATES: THE DYNAMICS OF COUPLED ELECTRICITY MARKETS 19 (n.d.), *available at* http://www.stud.ntnu.no/~klausv/publications/TGC2003.pdf (last visited Jan. 15, 2005).

24. *See* section IV(c) *infra* discussing the Italian TGC system. *See also* CATHERINE MITCHELL & THERESA ANDERSON, U.K. DEP'T OF TRADE & INDUS., THE IMPLICATIONS OF TRADABLE GREEN CERTIFICATES FOR THE U.K. 12 (2000), *available at* http://www.dti.gov.uk/energy/renewables/publications/pdfs/rep218.pdf (maintaining that the proposed Danish TGC system contained a reference to a Ministerial Power allowing the government to waive or reduce TGC target in any one year against unforeseen circumstances).

remedies affecting the supply side – such as diversification of technologies or price caps – could be introduced. Indeed, including several types of clean technologies in a TGC system or setting a price cap for certificates could minimise the risk of price hikes due to insufficient or irregular supply.[25] However, a price cap could also exclude some technologies from the market – because their unit price would be above the limit – thus reducing customers' choice.[26] Similarly, establishing a penalty for non-compliance with the certificate purchase obligation would increase market stability by setting a maximum price for certificates, but it would also raise concerns about the final use of funds collected.[27]

To the end of increasing the benefits and countering the drawbacks endogenous to a TGC scheme, cross-border trading of certificates could be helpful.[28] The establishment of an E.U.-wide TGC market would indeed provide a wide range of advantages and, in particular, it would secure a cost-effective siting and development of renewables, because RES facilities would be located where they could produce the most at the lowest production costs.[29] Simulation models[30] show that a TGC system at the E.U. level would allow fulfilling the E.U.'s 22% RES-E target with potential cost savings of about 15% per year, provided that sound market conditions are created.

In addition, a pan-European TGC scheme would facilitate the setting and achievement of national RES-E targets by allowing Member States with a shortage of TGCs to fulfill their obligations by importing certificates from countries with a surplus of them.[31] A larger market would also favour RES investments

25. *See* Lene Nielsen & Tim Jeppesen, *Tradable Green Certificates in Selected European Countries – Overview and Assessment*, 31 ENERGY POL'Y 1, 5 (2003).

26. *See* CATHERINE MITCHELL & THERESA ANDERSON, U.K. DEP'T OF TRADE & INDUS., THE IMPLICATIONS OF TRADABLE GREEN CERTIFICATES FOR THE U.K. 13 (2000).

27. *See* G.J. SCHAEFFER ET AL., ENERGY RESEARCH CTR. OF THE NETH., THE IMPLICATIONS OF TRADABLE GREEN CERTIFICATES FOR THE DEPLOYMENT OF RENEWABLE ELECTRICITY: MID-TERM REPORT 25 (1999) (suggesting four possible destinations for the money raised through penalties: a) general means of the state; b) renewable energy fund; c) income for the Control Body; and d) reimbursement to obliged parties who have complied their obligation).

28. Some relevant initiatives and studies in this field, such as the RECS (renewable energy certification system) project, were voluntarily launched by several European electricity companies in 1999, in order to promote the development of a TGC system in Europe and to lobby to make it formally recognised by the European Union Member States and the European Commission. For further details *see, e.g.*, Giulio Cicoletti, Rec's Standards for Market Based Support Schemes (Apr. 26, 2004) (unpublished manuscript, *available at* www.ecoenergymeeting.com). *See also* ELECTROWATT-EKONO, PRE-STUDY ON THE POSSIBILITIES AND OBSTACLES FOR ESTABLISHING NORDIC CO-OPERATION ON GREEN CERTIFICATES (2002), *available at* www.norden.org/energi/sk/EconoQ090-003A.PDF. The latter paper was commissioned by the Nordic Council of Ministers to research the possibility of creating a common TGC among Finland, Sweden, Norway, and Denmark.

29. *See* Morthorst, *supra* note 10, at 1089.

30. *See* M.H. VOOGT ET AL., ENERGY RESEARCH CTR. OF THE NETH., RENEWABLE ENERGY BURDEN SHARING REBUS: EFFECTS OF BURDEN SHARING AND CERTIFICATE TRADE ON THE RENEWABLE ELECTRICITY MARKET IN EUROPE (2001), *available at* http://www.ecn.nl/docs/library/report/2001/c01030.pdf. *See also* Niklas Knutsson, Dynamics of an EU System for Tradable Green Certificates 33–34 (2002) (unpublished Master of Science thesis, Linkopings Universitet, Swed.), *available at* http://web.comhem.se/~u31437179/documents/d-uppsats.pdf.

31. *See* Morthorst, *supra* note 10, at 1090. However, some governments may prefer to reach their RES-E targets domestically in order to achieve other policy goals, such as local employment and environmental

because the higher number of actors involved in the system could decrease the risk of certificate price volatility linked to yearly stochastic variation of renewables.[32] Besides, cross-border trading would reduce transactional costs[33] – which are proportional to the volume of transactions – and also national government interventions thus making domestic energy policies less contestable.[34]Finally, by decoupling "greenness" from physical energy, TGCs would allow power trading among E.U. countries while overcoming the problems of interconnection and access to the grid.[35]

Along with the advantages listed above, TGCs seem the most suitable policy tool for the creation of an E.U.-wide framework for RES-E promotion, under the E.U. Council Directive 01/77/EC.[36] Indeed, pursuant to article 4 (2) of the above law, by October 2005, the E.U. Commission might propose the adoption of a common RES-E support mechanism, which should, inter alia, meet the principles of cost-efficiency and market competition. These requirements make cross-border certificate trading preferable to alternative promotional measures.[37] As most E.U. countries are estimated to fail their 2010 objectives under the Directive – should they rely solely on current policies[38] – international trade could

benefits. *See* M.A. UYTERLINDE ET AL., ENERGY RESEARCH CTR. OF THE NETH., RENEWABLE ELECTRICITY MARKET DEVELOPMENTS IN THE EUROPEAN UNION, FINAL REPORT OF THE ADMIRE REBUS PROJECT 111 (2003), *available at* http://www.ecn.nl/docs/library/report/2003/c03082.pdf.

32. *See* Morthorst, *supra* note 10, at 1089 (contending that a larger market would be a buffer towards short-term fluctuations in the supply of renewable energy and of green certificates to the market, thus preventing large fluctuations in price determination at certificate markets).

33. *See* RECERT, *supra* note 12, at 6.

34. *See* ISABEL KÜHN ET AL., RENEWABLE ELECTRICITY & LIBERALISING MARKETS (REALM), WORKING GROUP III: HOW TO IMPROVE THE FRAMEWORK AND DESIGN OF NATIONAL POLICIES FOR THE PROMOTION OF RENEWABLE ELECTRICITY: OBSERVATIONS OF GERMANY, THE NETHERLANDS, AND THE U.K.: FINAL PAPER 16 (1999) (contending that "[I]nternationalisation of a certain type of support mechanism usually makes the policy less contestable, can cut down government interventions and reduces trade distortions.").

35. *See* G.J. SCHAEFFER ET AL., ENERGY RESEARCH CTR. OF THE NETH., OPTIONS FOR DESIGN OF TRADABLE GREEN CERTIFICATE SYSTEMS 7 (2000) (stating that "[t]he main characteristic of green certificates is that they are 'facilitators' of trade in greenness. By separating the markets, the trade in greenness produced by renewable energy generation is de-coupled, as far as that is possible, from physical constraints linked to trade in electricity.").

36. *See* Council Directive 01/77/EC, *supra* note 4. Art. 4 (2) of the Directive states:

> Any proposal for a framework should: (a) contribute to the achievement of the national indicative targets; (b) be compatible with the principles of the internal electricity market; (c) take into account the characteristics of different sources of renewable energy, together with the different technologies, and geographical differences; (d) promote the use of renewable energy sources in an effective way, and be simple and, at the same time, as efficient as possible, particularly in terms of cost; (e) include sufficient transitional periods for national support systems of at least seven years and maintain investor confidence.

37. However, to the end of promoting renewables, some consider feed-in tariffs preferable to TGCs. *See* WWF, PROGRESS REPORT ON THE IMPLEMENTATION OF THE EUROPEAN RENEWABLES DIRECTIVE (n.d), *available at* www.panda.org/downloads/europe/renewablesdirectiveoctober2003.pdf (last visited Jan. 15, 2005).

38. *See* COMM'N OF THE EUROPEAN CMTYS., *supra* note 5, at 13, which states:

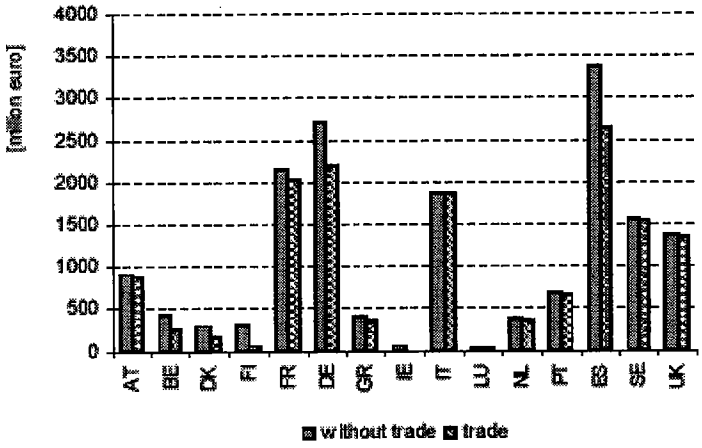
> [A]lthough progress towards meeting the targets has begun, the 2010 target will not be achieved under current policies and measures, even under a scenario that builds in reductions in total electricity demand as a result of new energy efficiency measures. Instead, currently implemented policies will probably result in a share of between 18% and 19% in 2010 . . . .

See also UYTERLINDE ET AL., *supra* note 31, at 110.

represent a possible strategy to increase the likelihood of achieving those goals.[39] As a result, the E.U. Commission could propose the adoption of a common TGC system evolving from the harmonisation of existing national schemes. In such a case, current domestic TGC mechanisms could be implemented only until 2012; after that date, by contrast, national schemes might need to be amended to remove the differences among them, which could hamper the functioning and efficiency of a common TGC system.

Hence, the possibility of creating a pan-European scheme and achieving the aforementioned advantages seems contingent on identification and harmonisation of the most substantial incompatibilities among current national TGC models.[40]

FIGURE 1: COSTS OF ACHIEVING NATIONAL TARGETS FROM THE E.U. COUNCIL DIRECTIVE 01/77/EC, WITHOUT AND WITH AN E.U. TRADING SCHEME.[41]



III. MAIN DIFFERENCES AMONG EXISTING TGC SYSTEMS

Currently, all the existing or planned TGC systems in E.U. Member States present heterogeneous features resulting from distinct political priorities or from uneven climatic and physical conditions. No system is endogenously superior to others, but three main differences among national mechanisms might pose a threat to the practical functionality of a pan-European system.[42]

39. UYTERLINDE ET AL., *supra* note 31, at 111.

40. On the need for harmonisation of national certificates, see M.G. BOOTS ET AL., ENERGY RESEARCH CTR. OF THE NETH., THE INTERACTION OF TRADABLE INSTRUMENTS IN RENEWABLE ENERGY AND CLIMATE CHANGE MARKETS: FINAL REPORT 78 (2001), *available at* http://www.ecn.nl/docs/library/report/2001/c01048.pdf.

41. A.L. VAN DIJK ET AL., *supra* note 13, at 54.

42. For a detailed description and assessment of the differences among TGC systems in the E.U., see Lene Nielsen & Tim Jeppesen, *Tradable Green Certificates in Selected European Countries – Overview and Assessment*, 31 ENERGY POL'Y 1, 7–11 (2003).

The first difference relates to the *definition of technologies eligible for certification:* indeed, some countries limit trade to energy generated by certain kinds of sources whilst others include – within the scope of certification – not only electricity but also heat and gas generated from RES. National choices on certifiable clean energy sources may be based on the wish to encourage development of new or less-competitive technologies, which – unlike existing or mature technologies – could need extra financial compensation.

The most controversial clean energy sources are waste and hydropower.[43] Indeed, while some Member States exclude waste incineration from RES or make distinctions on the basis of the biodegradable and not-biodegradable fractions being burned, other countries – such as Italy – consider such a technology always certifiable regardless of the nature of waste. By the same token, hydropower is often excluded from certification, being considered an already competitive technology with limited potential for further improvement.[44] Different definitions on technology sources and scope of certification could cause market segmentation as well as market distortions and, therefore, cannot coexist in a prospective E.U. trading scheme for certificates.

The second relevant difference among TGC systems in Europe concerns *mechanisms used to reduce certificate price volatility and stabilise domestic certificate markets.* Indeed, national schemes do not contemplate uniform provisions on validity-time, banking, borrowing, penalties, and minimum and maximum prices for certificates. In addition, while some countries have appointed an authorised body to carry out market stabilisation, others do not possess such a body.

Different national arrangements to counter certificate price volatility can make such titles more heterogeneous and, therefore, decrease the liquidity of a prospective European market. However, the larger size of an E.U.-wide market would make the system inherently more stable, thus reducing the need for stabilisation mechanisms.

The third relevant difference among existing or planned TGC schemes in the E.U. concerns the kinds of *measures co-existing with TGCs in support of clean energy sources.* Indeed, most E.U. countries are currently using TGCs in combination with other RES promotional measures because they need a transi-

43. *See, e.g.*, Klaus Vogstad, Designing Market-Oriented Environmental Policy Instruments: The Case of Tradable Green Certificates 4 (2003) (unpublished manuscript, *available at* http://www.stud.ntnu.no/~klausv/publications/Petten2003.pdf) (stating that hydropower inclusion in a TGC system would only generate additional income to hydropower utilities because it is an already mature technology, and nowadays projects compatible with environmental interests are limited. As regards waste incineration, the author maintains that it should be included or excluded on the basis of what it is incinerated).

44. However, in 2002, Austria started implementing a mono-technology TGC scheme, covering only electricity generation from small-scale hydro power plants (less than ten mega watts (MW)). Such a scheme was shortly abolished because it left the setting of many design features to the nine Austrian federal provinces, and this affected the practical functionality and interoperability of the system. *See* Reinhard Madlener & Jens Drillisch, Tradable Certificate Schemes for Single Renewable Electricity Technologies: The Case of Small-Scale Hydro Power Promotion in Austria (2002) (unpublished manuscript, *available at* http://www.cepe.ethz.ch/download/staff/reinhard/maddrill_iaee2002_header.pdf). *See also* AUS. WIND ENERGY ASS'N, IG WINDKRAFT, WINDENERGY IN AUSTRIA – LEGAL FRAMEWORK (2002), *available at* http://www.igwindkraft.at/. *See also* UYTERLINDE ET AL., *supra* note 31, at 30.

tional phase before switching from old to new policy instruments or because they want to keep existing measures in place while allowing national RES-E producers to participate in certificate trading abroad. Finally, Member States might opt for a permanent combination of incentive measures in order to compensate for possible disadvantages of TGC systems.[45]

Lack of harmonisation on measures supplementing TGCs could lead to unfair competition among national and foreign counterparts and might pose threats, such as States' support leaking abroad or oversupply of certificates available on the market.[46] As a result, a prospective E.U.-wide system should be characterised by access to information and absolute transparency on possible national subsidies supplementing TGCs. Furthermore, internal market distortions could be prevented either by completely abolishing supporting RES measures additional to TGCs or by compensating payments to account for such support schemes at the border.

In addition to the three differences listed above, a further distinction among national TGC schemes relates to the market actors under the obligation to buy certificates. Indeed, some E.U. countries impose quotas on energy suppliers, others oblige consumers, whereas Italy distinguishes itself for posing the purchase obligation on producers and importers. Distinct choices on market actors legally compelled to buy certificates could lead to distortions in a prospective E.U. single-certificate market. Moreover, imposing the purchase obligation on end-consumers – rather than on producers or suppliers – is expected to cause less adverse effects on competition and be more consistent with the "polluter pays" principle.[47]

Despite the numerous prima facie incompatibilities among national TGC systems, the establishment of an international TGC market will not necessarily result in the opening of a Pandora's box. Indeed, given the presence of the necessary political will, none of the potential conflicts seems intractable; comparing and evaluating national cases can help to find possible synergies and provide useful information for a better design of a well functioning and efficient European TGC system.

IV. SELECTED NATIONAL EXPERIENCE

A. The United Kingdom

Introduced in April 2002, and amended in March 2004,[48] the Renewables

45. *See* G.J. SCHAEFFER ET AL., ENERGY RESEARCH CTR. OF THE NETH., THE IMPLICATIONS OF TRADABLE GREEN CERTIFICATES FOR THE DEPLOYMENT OF RENEWABLE ELECTRICITY, MID-TERM REPORT 37 (1999).

46. *See* Niklas Knutsson, Dynamics of an EU System for Tradable Green Certificates 39 (2002) (unpublished Master of Science thesis, Linkopings Universitet, Swed.).

47. TGC models imposing the purchase obligation on end-consumers are considered preferable to other schemes, because they would not allow consumers to pass on their obligation, and they would decrease the likelihood of unfair competition. *See* G.J. SCHAEFFER ET AL., ENERGY RESEARCH CTR. OF THE NETH., OPTIONS FOR DESIGN OF TRADABLE GREEN CERTIFICATE SYSTEMS 17 (2000).

48. *See* Renewables Obligation Order 2002, 2002 Stat. R. & O. 914, *available at* http://www.dti.gov.uk/energy/renewables/publications/pdfs/obligation_2002.pdf (last visited Jan. 2005); Re-

Obligation (RO) is the main United Kingdom (U.K.)[49] policy tool aimed at promoting RE generation and at reducing greenhouse gas emissions. According to the U.K. Department of Trade and Industry (DTI), by 2010 the Obligation should create a strong and growing RES-E demand – worth over £1 billion British pounds (equivalent to around $1,859,170,000 U.S. dollars (USD)) – and save around 2.5 million tonnes (equivalent to 2.5 metric tons) of annual carbon emissions from 2010 onwards.[50] However, the RO is also expected to increase the yearly electricity cost to British consumers by around 0.5%.

Under the new RES-E incentive scheme all licensed electricity suppliers are required to supply a specified and growing proportion of their electricity sales from a choice of eligible RES. The goal for 2004 equals to 4.9% of total electricity supplied; it increases to 10.4% by 2010,[51] and it should reach 20% by 2020.[52] This is quite an ambitious target considering that during the first year of RO application (2002–03), the U.K. sourced only about 1.8% of its electricity from eligible RES, thus missing the target set for the period in question (3%).[53] Moreover, given the present framework and institutional barriers,[54] renewables under the RO scheme are expected to contribute only by 8% to the 2010 targets; whereas a further 2% should be supplied from renewables not included in the RO mechanism.[55]

Almost all types of RES-E are eligible for Renewable Energy Certificates

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newables Obligation (Amendment) Order 2004, 2004 Stat. R. & O. 924, *available at* http://www.legislation.hmso.gov.uk/si/si2004/20040924.htm#note3 (last visited Jan. 2005). *See also* Renewables Obligation (Scotland) Order 2002, 2002 Stat. R. & O. 163, *available at* http://www.scotland-legislation.hmso.gov.uk/legislation/scotland/ssi2002/20020163.htm (last visited Jan. 15, 2005) (the equivalent Bill for Scotland); Renewables Obligation (Scotland) Order 2004, 2004 Stat. R. & O. 170.

49. Although the Scottish system is based on a different law, it is almost identical to the mechanism operating in England and Wales. Thus, in this article, any reference to the U.K. system should be interpreted as referring to both regional systems.

50. *See* U.K. DEP'T OF TRADE & INDUS., NEW AND RENEWABLE ENERGY: PROSPECTS FOR THE 21ST CENTURY: THE RENEWABLES OBLIGATION STATUTORY CONSULTATION 5 (n.d.), *available at* http://www.sust.sbg.ac.at/download/sschool02/renewableobligations.pdf. (last visited Jan. 15, 2005).

51. *See* U.K. DEP'T OF TRADE & INDUS., YEARLY TARGETS (n.d.), *available at* http://www.dti.gov.uk/energy/renewables/policy/yearly_targets.shtml (last updated Feb. 21, 2003).

52. *See* U.K. DEP'T OF TRADE & INDUS., RENEWABLES INNOVATION REVIEW, SUMMARY OF KEY FINDINGS (2004), *available at* http://www.dti.gov.uk/energy/renewables/policy/introduction.pdf. *See also* DEP'T OF TRADE & INDUS., OFFICE OF THE DEPUTY PRIME MINISTER, THE DRAFT POLICY GUIDANCE: CONSULTATION PAPER 1–3 (2003), *available at* http://www.dti.gov.uk/energy/renewables/policy/policyguidance.pdf.

53. *See* U.K. DEP'T OF TRADE & INDUS., ENERGY TRENDS 2003, *available at* http://www.dti.gov.uk/energy/renewables/policy/rirconclusions.pdf (last visited Jan. 2005). *See also* U.K. DEP'T OF TRADE & INDUS., OUR ENERGY FUTURE – CREATING A LOW CARBON ECONOMY 10 (2003), *available at* http://www.dti.gov.uk/energy/whitepaper/ourenergyfuture.pdf (showing that in 2002 only about 3% of U.K. electricity was from RES).

54. *See, e.g.*, OXERA ENVTL. & ARUP ECONS. & PLANNING, A REPORT TO THE DTI AND THE DTLR: REGIONAL RENEWABLE ENERGY ASSESSMENTS (2002), *available at* http://www.dti.gov.uk/energy/renewables/policy_obligation/oxera_renew.pdf (stating, for example, that the planning system may take several years to incorporate regional targets into forward plans and hence into development control decisions).

55. *See* U.K. DEP'T OF TRADE & INDUS., RENEWABLES INNOVATION REVIEW, SUMMARY OF KEY FINDINGS 5 (Feb. 2004).

(ROCs), but stations must be commissioned or be re-equipped after 1 January 1990. Similarly, hydropower plants exceeding 20 MW declared net capacity can be awarded certificates only if commissioned after April 2002.[56]

Wind power, both on- and off-shore, is presently the only economic scaleable technology; it is also expected to deliver the majority of the required RE growth necessary to meet the 2010 target and to continue to be the dominant technology up to 2020.[57] The DTI has recently called for investments in RES other than wind and for diversification of technologies through specific development plans tailored to fuel cells, wave/tidal, biomass, and solar photovoltaic in order to provide the best balance of the U.K.'s and other nations' environmental benefits.[58]

As far as waste is concerned, only electricity derived from biomass, agriculture, and energy crops through advanced conversion technologies (e.g. pyrolysis, gasification, and anaerobic digestion) is certifiable, whilst power generated from mixed waste (i.e. containing not biodegradable fractions) is not eligible for certification.[59] Co-firing – i.e. using fossil fuels alongside biomass – is allowed until 31 March 2011, as a transitional step towards more extensive use of energy crops but may fulfill only up to 25% of suppliers' obligations. Moreover, after 31 March 2006, co-firing stations will be entitled to certificates only for energy produced by using at least 75% of energy crops as biomass.

Further exclusions concern electricity sold under a "NFFO" contract,[60] electricity generated from peat and, finally, electricity produced from RES outside the U.K., its territorial waters, and the Continental Shelf. The Government, however, intends to amend the RO scheme to accept certificates issued abroad under the reciprocity principle. Each certificate indicates that 1 MWh of RES-E can be banked to meet up to 25% of suppliers' yearly quotas but cannot be borrowed.

Suppliers can comply with their obligations not only by purchasing physical RE or ROCs, but also by paying the buy-out price to the Office of Gas and Electricity Market (OFGEM). The buy-out price functions as a cap-price on the RO; it is adjusted each year on the basis of the retail price index (RPI), and it is cur-

56. *See* U.K. DEP'T OF TRADE & INDUS., ELIGIBLE RENEWABLES, http://www2.dti.gov.uk/energy/renewables/policy/eligible_renewables.shtml (last updated May 2004). *See also* OXERA ENVTL. & ARUP ECONS. & PLANNING, A REPORT TO THE DTI AND THE DTLR: REGIONAL RENEWABLE ENERGY ASSESSMENTS 3 (2002).

57. *See* U.K. DEP'T OF TRADE & INDUS., RENEWABLES INNOVATION REVIEW, SUMMARY OF KEY FINDINGS 5 (Feb. 2004), *available at* http://www.dti.gov.uk/energy/renewables/policy/introduction.pdf.

58. *Id.*

59. *See* U.K. DEP'T OF TRADE & INDUS., NEW AND RENEWABLE ENERGY: PROSPECTS FOR THE 21ST CENTURY: THE RENEWABLES OBLIGATION PRELIMINARY CONSULTATION 8, *available at* http:www.dti.gov.uk/renew/ropc.pdf (last visited Jan. 2005).

60. The Non-Fossil Fuel Obligation (NFFO) was the previous major policy instrument for encouraging growth within the British RE industry. Under the NFFO, electricity supply companies in the U.K. were required to secure specified amounts of new generating capacity from non-fossil sources, including renewables. This renewables capacity was secured through contracts with renewables generators at premium rates. *See* U.K. DEP'T OF TRADE & INDUS., ORIGINS AND OPERATION, http://www.dti.gov.uk/energy/renewables/policy/origins_operation.shtml (last updated Feb. 21, 2003).

rently equal to £30.51 (equivalent to around $56.60 USD) per MWh.[61] Each year the proceeds of the buying-out price mechanism are returned to all licensed suppliers who have fulfilled their obligations in proportion to the number of ROCs they have presented. Conversely, suppliers not meeting their obligations can be the subject of sanctions imposed by the OFGEM, which is responsible, inter alia, for informing the Secretary of State on RO compliance. In addition to this duty, the OFGEM plays a central role in the system by: accrediting generators, issuing ROCs, assessing compliance, monitoring implementation, calculating the buyout price, and receiving and recycling buy-out funds.

In the first year of RO operation (from 1 April 2002 to 31 March 2003), some 5,562,669 certificates were issued: 4,552,524 of which were in England and Wales and 1,010,145 in Scotland,[62] while 2428 certificates were revoked with 2604 replacement ROCs being issued.[63] Almost 50% of ROCs issued concerned electricity from landfill gas generation, whereas on-shore wind generation contributed around 20%.[64] Suppliers' performance in terms of correct production of ROCs and/or the payment of buy-out varied: out of seventy-one supply licensees in England and Wales, thirty-eight had a RO and twelve met their obligation wholly through producing ROCs. Nine suppliers made buy-out payments for 100% of their obligation. The equivalent figures for Scotland were as follows: sixteen out of twenty-eight suppliers under obligation achieved their quotas wholly through producing ROCs, whilst four suppliers paid the buy-out price to meet 100% of their quotas. Seven supply licensees failed to produce the required number of ROCs or to make the full alternative payment to the buy-out fund prior to 1 October 2003. As far as redistribution of buy-out price is concerned, twenty-three suppliers received recycled money for the total sum of £79,251,930 (equivalent to around $147,154,984 USD) in England and Wales, whereas in Scotland nineteen suppliers received £11,267,124 British pounds (equivalent to around $20,920,796 USD) collectively.[65]

A very positive feature of the U.K. TGC system is that it provides substantial pressure on market actors: indeed, beside the very ambitious targets for the coming years, the provisions on limited banking and on penalties should lead to installation of new capacities.[66] Likewise, the long planning horizon and the high credibility of the system should favour RES investments by giving security

61. *See* U.K. DEP'T OF TRADE & INDUS., COMPLYING WITH THE OBLIGATION, http://www.dti.gov.uk/energy/renewables/policy/complying.shtml (last updated Feb. 21, 2003).

62. *See* OFFICE OF GAS & ELEC. MKT., THE RENEWABLES OBLIGATION, OFGEM'S FIRST ANNUAL REPORT (2004), *available at* http://www.ofgem.gov.uk/temp/ofgem/cache/cmsattach/6125_renewables_obligation.pdf [hereinafter OFGEM].

63. "The 2,428 ROCs were revoked because correspondence with the operator of a generating station led Ofgem to determine that the station should be accredited under both biomass and co-firing technology codes, and the ROCs in question should have been issued as biomass ROCs. This was because the percentage of fossil fuel the generating stations used could vary from month to month . . . ." *Id.* at 22.

64. OFGEM, *supra* note 62, at 18.

65. *Id.* at 23.

66. A further reason for new investment in generation is represented by the closure of old coal and nuclear capacity. *See* U.K. DEP'T OF TRADE & INDUS., RENEWABLES INNOVATION REVIEW, SUMMARY OF KEY FINDINGS 4–5 (2004), *available at* http://www.dti.gov.uk/energy/renewables/policy/introduction.pdf.

to potential investors.[67] However, since current supply capacity is not sufficient to meet the government's demand, ROCs' price is very high at the moment.An international TGC system could not only spur the installation of new plants, it could also represent an excellent option to reduce ROCs' price.

B. Sweden

The Swedish TGC system entered into force in May 2003,[68] after considerable delay of the Government schedule.[69]The objective of the new mechanism is to increase RES-E consumption by ten terrawatt hours (TWh) from 2002 to 2010,[70] which is about 50.5% of gross national electricity consumption. Such a target is lower than that set by the E.U. Council Directive 01/77/EC – that is 60% – but it could be shortly improved depending on favourable climatic conditions for RES-E production in the next years.[71]

Under the Swedish TGC scheme, the purchase obligation is imposed on end consumers,[72] who are allowed to manage their obligation themselves by paying an annual registration fee:[73] about €55 euros (equivalent to around $70 USD) in 2003; €33 euros (equivalent to around $42 USD) in 2004, and €11 euros (equivalent to around $14 USD) in and after 2005.[74] Alternatively, electricity suppliers can manage the obligation quota for a number of customers, to whom they pass

67. The first year of operation (2002–2003) proved quite successful: by the end of the period in question, the number of accredited stations increased from 431 to 505. *See* OFGEM, *supra* note 62, at 2.

68. See the Swedish Government Report on Introduction of Quota Based Swedish Certificate System, (*Hanndel med elcertifikat Ett nytt sätt at främja el från förnybara energikällor*) SOU 2001:71, 33–39 Stockholm, Sweden (2001).

69. Indeed, the Swedish TGC system was supposed to come into force two years earlier, but its implementation was strongly opposed by several associations. As an example of the criticism surrounding the introduction of TGCs, see SOREN KROHN, DANISH WIND INDUS. ASS'N, SWEDISH GREEN CERTIFICATE PLANS COULD HALT WIND, http://www.windpower.org/en/news/swedish.htm (updated Sept. 30, 2001).

70. *See* SWEDISH MINISTRY OF INDUS., EMPLOYMENT, & COMMUNICATIONS, COOPERATION FOR A SECURE, EFFICIENT AND ENVIRONMENTALLY-FRIENDLY ENERGY SUPPLY (2002), *available at* http://www.sweden.gov.se/content/1/c6/01/84/61/4c107b51.pdf (summary of the Swedish Government Energy Bill 2001/02:143). This document also lists some of the reasons leading the Government to adopt TGCs: a) to lower RES-E price for end-consumers; b) to stimulate technological innovation and competition; c) to allow all RES to compete on a level playing field; d) to shift the financial burden to support renewables from the government to the market.

71. It is worth noting that when Council Directive 01/77/CE was adopted, Sweden stated that it considered 52% to be a reasonable RES-E production target to be achieved by 2010 because the yearly average production quota is usually lower than that registered in the reference year (i.e. 1997). In other words, the yearly RES-E production quota is usually equal to 46% of overall energy production, whilst in 1997 it reached 49% because of exceptional temperature and climatic conditions. *See* SWEDISH MINISTRY OF INDUS., EMPLOYMENT, & COMMUNICATIONS, ANALYSIS OF SWEDEN'S SUCCESS IN ACHIEVING ITS NATIONAL INDICATIVE TARGETS FOR RES ELECTRICITY 5 (2003), *available at* http://europa.eu.int/comm/energy/res/legislation/doc/electricity/member_states/sv_2003_report_art3-3_en.pdf.

72. *Id.*

73. It is worth noting that although Sweden is an E.U. Member State, it distinguishes itself for not adopting the euro as its national currency, but instead keeping its national currency, which is the Swedish Krone (or SEK). However, in this paper, values are most often converted or simply expressed in euro (€).

74. *See* ELECTROWATT-EKONO, PRE-STUDY ON THE POSSIBILITIES AND OBSTACLES FOR ESTABLISHING NORDIC CO-OPERATION ON GREEN CERTIFICATES 32 (Dec. 16, 2002), *available at* www.norden.org/energi/sk/EconoQ090-003A.PDF.

the electricity certificate cost – which is equivalent to around €0.55 ct (equivalent to around $.71 cents USD) per kWh[75] – as a separate item of their electricity bill. Large energy intensive industries are exempted from the purchase obligation, in order to avoid distortion of competition between domestic and foreign industries. Pursuant to the Electricity Certificates Act and following amendments, in 2003 the quota imposed on obliged parties was equal to 7.4% of purchased electricity, and it will increase annually, reaching 16.9% in 2010.[76] Wind, solar, geothermal, wave, and bio-fuel plants are eligible for certification, whilst hydropower is subject to some restrictions, including generation capacity.[77] Indeed, only small-scale hydropower (<1.5 MW) plants or large-scale hydro stations activated or re-activated after 1 January 2002, or whose capacity has been increased after that date, are certifiable.

Each certificate is for 1 MWh RES-E production; it has no expiry date and exists only in electronic form. The national grid operator (Svenska Krafnat) issues and allocates certificates, whereas the Swedish Energy Agency accredits, registers and monitors plants, redeems certificates, and finally decides on sanctions.

Until 2007, the Government guarantees a minimum price for certificates. The minimum was equal to 60 SEK per MWh (equivalent to about €6.60 euros and to $8.50 USD per MWh) in 2003. A detailed penalty mechanism obliges non-compliant consumers to pay a fine equal to 150% of the average volume-weighted certificate price during the previous year, although the amount of the fine is capped until the year 2008. Unlike the purchase of certificates, the fine is not tax-deductible and it amounted to 175 SEK per MWh (about €19.30 euros or $25.30 USD per MWh) in 2003, whilst it is equal to 240 SEK per MWh (equivalent to €26.30 euros and to $34.60 USD per MWh) in 2004. The Swedish government wishes to extend certificate trading beyond national borders and has declared that Danish and Dutch green certificates could be used as substitutes to the Swedish ones; exporting certificates is also allowed.

On the basis of a preliminary assessment, the broad scope of application of the new-born Swedish TGC system – which includes both new and old plants – does not seem very suitable to promote significant installation of new RES-E capacity. By contrast, accrediting only the most recent plants or introducing a rolling redemption period could best stimulate RES-E supply growth, and also avoid windfall profits for old installations. Likewise, allowing limited banking – instead of permanent duration – of certificates could grant stability to the certifi-

75. *See* ENERGY RESEARCH CTR. OF THE NETH., RENEWABLE ELECTRICITY FACT SHEETS EU COUNTRIES: FACT SHEET SWEDEN, http://www.renewable-energy-policy.info/relec/sweden/policy/greencertificates.html (last updated Sept. 14, 2004).

76. *See* SWEDISH MINISTRY OF INDUS., EMPLOYMENT, & COMMUNICATIONS, ANALYSIS OF SWEDEN'S SUCCESS IN ACHIEVING ITS NATIONAL INDICATIVE TARGETS FOR RES ELECTRICITY 6–7 (2003), *available at* http://europa.eu.int/comm/energy/res/legislation/doc/electricity/member_states/sv_2003_report_art3-3_en.pdf.

77. *See* SWEDISH ENERGY AGENCY, ELECTRICITY CERTIFICATES – NEW LEGISLATION FOR THE ENVIRONMENT AND FOR THE FUTURE (n.d.), *available at* http://www.stem.se/web/biblshop_eng.nsf/FilAtkomst/ElcertEng.pdf/$FILE/ElcertEng.pdf?OpenElement (last visited Jan. 15, 2005).

cate market with less adverse effects on new capacity installation.[78]

C. Italy

Following the adoption of the Legislative Decree of 16 March 1999[79] and of the Decree of the Ministry of Industry, Trade, and Handicraft of 11 November 1999,[80] the Italian TGC system became operational in January 2002. From then, all gray (i.e. conventional) electricity producers and importers above the threshold of 100 GWh are under the obligation to certify that at least 2% of their yearly net sale comes from new RES. The reason for the choice of producers and importers – instead of distributors or consumers – as the parties under the purchase obligation, lies in the wish to reduce monitoring and control costs. Conventional power producers and importers can comply with their obligation by purchasing renewable power supplied by accredited plants commissioned or re-powered after 1 April 1999. Alternatively, the above obligation may be fulfilled by purchasing an equivalent amount of "green certificates" from certified plants or from the grid operator Gesture Della Rate di Trasmissione Nazionale (GRTN). Certified plants are entitled to green certificates only for the first eight years of activity; after this period, plants no longer qualify for certification, so that new capacities have to be installed in order to generate certifiable energy.

The scope of technologies eligible for certification is quite broad and – contrary to the requirements of Council Directive 01/77/EC[81] – includes electricity generated from municipal solid waste, regardless of the biodegradable fraction. This represents one of the main differences between the Italian TGC systems and other European schemes. According to an official report,[82] the ranking of plants by number of green certificates issued for power production in 2002 was as follows: hydro (45.9%); geothermal (20.3%); wind (18%); vegetal products or waste (15.7%).

Each certificate is good for 100 MWh of RES-E production and can be issued either on the basis of production that occurred in the previous year or on the estimate of the RES-E to be generated in the year following certificate issuance. The grid operator GRTN performs a number of functions. It accredits renewable power plants, issues green certificates, registers TGC transactions, and redeems

78. Concerns on unlimited banking are also expressed by M.H. VOOGT ET AL., ENERGY RESEARCH CTR. OF THE NETH., RENEWABLE ENERGY BURDEN SHARING REBUS: EFFECTS OF BURDEN SHARING AND CERTIFICATE TRADE ON THE RENEWABLE ELECTRICITY MARKET IN EUROPE (2001), *available at* http://www.ecn.nl/docs/library/report/2001/c01030.pdf.

79. *See* Legis. Decree, 16 Mar. 1999, 75 Gazz. Uff. 31 Mar. 1999, 96/92/CE, art. 11 (1)–(3), *available at* http://www.artigianinet.com/servizi/ambiente/energia/normative/doc/riasset.htm (last visited Jan. 15, 2005) (in Italian) (implementing the 1996 E.U. Directive on liberalisation of electricity markets).

80. *See* Ministerial Decree, 11 Nov. 1999, 292 Gazz. Uff. 14 Dec. 1999, *available at* http://www.autorita.energia.it/docs/riferimenti/decreto_991111.htm (last visited Jan. 15, 2005) (in Italian) (subsequent amendments made by Ministerial Decree, 18 Mar. 2002, 71 Gazz. Uff. 25 Mar. 2002).

81. See Council Directive 01/77/EC, *supra* at note 4, art. 2 (b), which only includes the biodegradable fraction of industrial and municipal waste within the definition of renewable sources, and point 8 of recitals states, "incineration of non-separated municipal waste should not be promoted under a future support system for renewable energy sources, if such promotion were to undermine the hierarchy."

82. GESTORE RETE TRANSMISSIONE NAZIONALE, ELECTRICITY FROM RENEWABLES: 2002 BULLETIN 15 (2003), *available at* http://www.grtn.it/eng/fontirinnovabili/bollettinienergia/BollettinoEnergia2002en.pdf.

certificates. The GRTN also owns the TGCs of the projects commissioned after 31 March 1999 under particular contracts (called CIP6), and has the right to sell such certificates at a regulated price.[83] Moreover, the grid operator retains the power to act as a market stabilizer: indeed, should TGC demand be too high, the GRTN could reduce the certificate price by selling "virtual" certificates – i.e. for future RES-E production – to be covered within a three—year period. By contrast, in case of oversupply of certificates, the grid operator could purchase some of them to reduce their number on the market and to increase their price, thus defending RES-E producers' interests.

Another relevant body of the Italian TGC system is the GME (Gestore del Mercato Elettrico), whose main duty is to operate a market where certificates can be freely traded. Transactions can also occur outside the pool through long-term contracts (up to eight years), which can be preferred by market operators to reduce uncertainty of the certificate price.

Certificates are valid for only one year. Each year on March 31, the grid operator redeems certificates and informs the Authority of Power and Gas (AEEG) about non-compliant parties that might be banned from participation in the pool. In 2002 and 2003, certificate mean price was equal to €101.02 euros (equivalent to around $131.05 USD) per MWh and to €98.88 euros (equivalent to around $128.27 USD) per MWh respectively (VAT included). The system provides for "reciprocity," which means that Italian producers and importers can fulfill their obligation by importing RES-E generated in countries adopting a similar support scheme, as long as those countries also acknowledge Italian certificates. From 2005 to 2012, compulsory quotas for importers and producers will be slightly increased (by 0.35% each year) since the current 2% figure is considered insufficient to achieve the Italian target, under the E.U. Council Directive 01/77/EC,[84] being equal to 25% of gross RES-E electricity consumption by 2010.

Although it is too early to evaluate the design and effectiveness of the Italian TGC system, some arrangements – such as time restrictions on plants' eligibility for certificates – promise to lead to significant installation of new RES-E capacity. As a matter of fact, some 181 new plants are planned for the coming years. However, a number of weaknesses can also be identified through a first assessment of the Italian scheme; indeed, Italy should revise its RES-E support system as to exclude from certification electricity derived from incineration of unsorted municipal waste in order to conform to the E.U. Council Directive 01/77/EC and to ensure acknowledgement of Italian certificates abroad. In addition, the choice of producers and importers as market actors under the certificate purchase obligation should be reconsidered because it could impair competition in a prospective European TGC market. Moreover, since Italian certificates are valid for only one year, banking could be permitted to reduce certificate price volatility, replacing the authority of the GRTN to intervene as a market stabilisa-

83. For further details, see Arturo Lorenzoni, *The Italian Green Certificates Market Between Uncertainties and Opportunities*, 31 ENERGY POL'Y 1, 34, 38 (2003).

84. *See* Legis. Decree, 29 Dec. 2003, 25 Gazz. Uff. 31 Jan. 2004, 2001/77/CE, art. 4 para. 1, *available at* www.camera.it/parlam/leggi/deleghe/testi/03387dl.htm (last visited Jan. 15, 2005) (in Italian).

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D. Belgium

Belgium is a federal State consisting of three regions: Flanders, Wallonia, and Brussels-capital. Since the enactment of the Special Law of Institutional Reform of 8 August 1988, RE has fallen under the jurisdiction of the regions, although some issues, such as offshore wind turbines, electricity transport, and fiscal measures are still a federal responsibility.[85] The E.U. Council Directive 01/77/EC sets the overall Belgian target for RES-E gross consumption at 6% by 2010, thus tripling the current share;[86] accordingly, the Flemish and Walloon regional objectives are equal to 5% and 6%, respectively.[87] By contrast, the Brussels region has not set its RES-E targets, yet.

As far as policy tools are concerned, two separate TGC schemes are in force in Flanders and Wallonia, whereas the Brussels region is still in the process of defining its regional TGC mechanism.[88] The Flemish and the Walloon TGC schemes possess several common features but differ on the basic issue of scope of certification. Indeed, in Wallonia, green certificates can be awarded not only to "traditional" green technologies but also to Combined Heat and Power (CHP) plants.[89] In addition, Walloon certificates are not only based on RES-E generation but also on CO_2 emission reduction that can be realised by RES compared to standard installations.[90]

Technologies' contribution to the achievement of RES objectives varies from region to region. In Wallonia, biomass has the lion's share, followed by small-scale hydropower, active and passive solar thermal applications, and wind energy. In Flanders, wind energy and biomass are expected to contribute two-thirds and one-third, respectively, to RES-E regional targets. Municipal waste combustion is also eligible for certification.[91]

85. *See* ISABELLE DE LOVINFOSSE & FREDERIC VARONE, RENEWABLE ELECTRICITY POLICY IN BELGIUM –POLICY CHANGE IN THE LIBERALIZED ELECTRICITY MARKET 4 (UCL Universite Catholique de Louvain, Working Paper No. 4, 2003), *available at* http://www.aurap.ucl.ac.be/Documents/WP4-AURAP%20300703.PDF.

86. In 2000, the RES-E share out of Belgian electricity production was less than 2%, with hydroelectric, solar, or geothermal installations contributing less than 1% and biomass and waste approximately 1% of total production. *See id.* at 5–6.

87. *See* ENERGY RESEARCH CTR. OF THE NETH., RENEWABLE ELECTRICITY FACT SHEETS EU COUNTRIES: FACT SHEET BELGIUM: TARGETS & OBJECTIVES, http://www.renewable-energy-policy.info/relec/belgium/targets.html (last updated Sept. 14, 2004).

88. *See* ENERGY RESEARCH CTR. OF THE NETH., RENEWABLE ELECTRICITY FACT SHEETS EU COUNTRIES: COUNTRY FACT SHEET BELGIUM: GREEN CERTIFICATES, http://www.renewable-energy-policy.info/relec/belgium/policy/greencertificates.html (last modified Sept. 14, 2004).

89. *Id.* However, on 5 March 2004 the Flemish Government approved a Decree concerning the implementation of a specific TGC scheme aimed at doubling the installed capacity of CHP in Flanders by 2012. The first certificates were expected to be issued in January 2005. *See* COGEN EUROPE, CHP-CERTIFICATES APPROVED IN FLANDERS, BELGIUM 27 (2004), *available at* http://www.cogen.org/news/news_archive_2004.htm.

90. *See* DE LOVINFOSSE & VARONE, *supra* note 86, at 27.

91. To the end of avoiding that the high number of certifiable technologies might impair the least competitive technologies, it has been suggested either market segmentation or assignment of a different number of certificates to the various kinds of RES-E. *See* A. Verbruggen, *Tradable Green Certificates in Flanders (Belgium)*, 32 ENERGY POL'Y 151, 165–176 (2004).

Under both regional schemes, the obligation is imposed on suppliers and grid operators, and it is calculated as a share of total electricity sold to final consumers. In 2004, the Flemish quota amounts to 3%, whereas the Walloon quota is set at 4%.[92]

All the Flemish and Walloon certificates are valid for five years and indicate 1 MWh of green power production but – as mentioned above – Walloon certificates also consider avoided CO_2.[93] The existence of price floors and penalties reduces certificate price volatility. Indeed, the Walloon and Flemish authorities guarantee a minimum price for certificates: €50 euros (equivalent to around $64.90 USD) per MWh in Flanders and €65 euros (equivalent to around $84.40 USD) per MWh in Wallonia. Moreover, electricity producers can sell their green certificates to the federal transmission system operator[94] at a minimum price, which varies according to the kind of RES used to produce "green" power: from €20 euros per MWh for biomass energy to €150 euros per MWh for solar energy.

As far as penalties are concerned, in 2004, fines to be paid for missing certificates were €100 euros (equivalent to around $129 USD) per MWh in Wallonia[95] and €125 euros (equivalent to around $162 USD) per MWh in the Flanders, and they will be gradually increased in the coming years.

One of the greatest problems of the Belgian TGC scheme concerns the small size of certificate markets, which might not only create considerable price volatility but also favour abuses by some market operators. Indeed, the overall shortage of certificates, together with the possibility of certificate banking and the increasing penalty rates, seems to encourage obligated parties to pay fines now and use available certificates in later periods.[96] High compulsory quotas, increasing penalties, and minimum guaranteed tariffs also tend to generate significant revenues only for the most cost-efficient technologies and to exclude less competitive RES. Moreover, lack of interoperability between regional schemes[97] decreases liquidity, transparency, and dynamism of Belgian RES-E

gium), 32 ENERGY POL'Y 151, 165–176 (2004).

92. *See* the Flemish Decree of 17 July 2000 on the Organization of the Electricity market, MONITEUR BELGE, 22 Sept. 2000; *see also* the Wallon Government Decree concerning the promotion of green electricity, of 4 July 2002 as quoted by The Comitè de Liason Energies Renouvelables (CLER), PREDAC WP 8, National Report: Belgium – 30/01/2004, at 13 *available at* http://www.cler.org/predac/IMG/pdf/reviewBelgium. pdf (last visited Feb. 10, 2005).

93. A ratio of CO_2 emissions-saving is defined by the Walloon Commission on Energy (CWAPE) for all the RES, and it is used to weigh the number of certificates that the electricity producers receive. *See* DE LOVINFOSSE & VARONE, *supra* note 86, at 29.

94. *Id.*

95. *See* DE LOVINFOSSE & VARONE, *supra* note 86, at 27.

96. *See* COMM'N OF THE EUROPEAN CMTYS., COMMISSION STAFF WORKING DOCUMENT: THE SHARE OF RENEWABLE ENERGY IN THE E.U.: COUNTRY PROFILES: OVERVIEW OF RENEWABLE ENERGY SOURCES IN THE ENLARGED EUROPEAN UNION 14 (2004), *available at* http://europa.eu.int/comm/energy/res/documents/country_profiles/2004_0547_sec_country_profiles_en.pdf.

97. Indeed, Walloon regional laws explicitly exclude validity of certificates beyond regional borders and, analogously, in the Flanders the exemption from distribution charges is only granted to RES-E produced within the Flemish region, although from February 2003 foreign production is also eligible for certification. *See* ENERGY RESEARCH CTR. OF THE NETH., RENEWABLE ELECTRICITY FACT SHEETS EU COUNTRIES: COUNTRY FACT SHEET BELGIUM: GREEN CERTIFICATES, http://www.renewable-energy-policy.info/relec/belgium/policy/greencertificates.html (last modified Sept. 14, 2004).

markets. To enhance the effectiveness of regional schemes, mutual recognition of certificates and creation of a single national or trans-national market are highly recommended.

E. Denmark

To secure RES-E growth and release the Government from the heavy burden of subsiding "green" technologies, in 1999 the Danish Parliament adopted a Bill[98] replacing the then existing feed-in tariffs with a TGC scheme. However, such a change in national energy policy proved less easy than expected due to strong opposition from the local industry sector[99] and the existence of a number of unsorted issues, concerning the design of the announced TGC mechanism.[100] As a result, Denmark is now in a "market limbo," and the implementation of the new system has been postponed from the beginning of 2003 to, possibly, the year 2005.

The Danish Electricity Supply Act of 2 June 1999, provides for the structure of the future national TGC system,[101] which is supposed to achieve the goal of sourcing 4% of total electricity consumption from RES.[102] Currently some 16% of Danish power consumption is covered by renewables and, therefore, only a small increase is needed to achieve the national target set out in the Directive 2001/77/EC, which is 20% by 2010.

The quota obligation is imposed on all consumers, including big companies, but distribution companies are allowed to buy RES-E and green certificates on behalf of their customers. Yearly quotas are laid down in advance of each year and cannot be changed subsequently;[103] simultaneously, preliminary quotas for the following five to ten years are announced.

Apart from waste stations and large hydropower plants (i.e. exceeding ten MW capacity), all the remaining RE technologies can be awarded certificates. Each certificate represents 1 MWh of RES-E, does not include any CO_2 credit or similar credit, and cannot form part of a CO_2 quota system.[104]

98. *See* Danish Electricity Supply Act, Act No. 375 of 2 June 1999, 20 para. 60 (1999), *available at* http://www.ens.dk/graphics/Publikationer/Laws/Bill_234.pdf.

99. *See* N. I. Meyer & A.L. Koefoed, *Danish Energy Reform: Policy Implications for Renewables*, 31 ENERGY POL'Y 579, 605–606 (2003).

100. *See* P. Fristrup, *Some Challenges Related to Introducing Tradable Green Certificates*, 31 ENERGY POL'Y 1, 15–19 (2003), pointing out the main obstacles and threats of using TGCs as part of the Danish energy policy. According to the author, the most prominent problems are related to managing the coexistence of multiple types of RES-E suppliers with just one policy tool. Fristrup also discusses the risk of gold-plating existing generators and aggravating the Danish production overflow, as a result of RES-E promotional schemes.

101. For a detailed description, *see* P.E. Morthorst, Danish Renewable Energy and a Green Certificate Market (n.d.) (unpublished manuscript, *available at* http://www.risoe.dk/sys/esy/renewable/policy_instr_pub_a.pdf) (last visited Jan. 15, 2005).

102. *See* CHRISTIAN KJAER, DANISH WIND INDUS. ASS'N, THAT WAS THEN – THIS IS TOMORROW (n.d.), *available at* http://www.windpower.org/media(501,1033)/that_was_then,_this_is_tomorrow.pdf (last visited Jan. 15, 2005).

103. In 2003, the compulsory purchase quota was supposed to be equal to 20% of electricity consumed by each consumer. *Id.*

104. THE DANISH ENERGY AGENCY, THE GREEN CERTIFICATE MARKET IN DENMARK: STATUS OF IMPLEMENTATION (2001), *available at* www.ens.dk/graphics/ENS_Forsyning/VE-bevismarked/VE-

Certificates are issued by two operators (Elkraft-System and Eltra) on the basis of accumulated production, typically during one month. They exist only in electronic form, have unlimited validity, and include various types of information, such as a unique identification number, the issuing authority, the source of energy, and the generating plant. They can be purchased through bilateral contracts or at special pools, but transactions must be registered with one of the two system operators (Eltra and Elkraft System) in order to have effect. Certificate banking is allowed, whereas borrowing is not permitted.

A minimum price for green certificates – equal to 100 Danish Krones (DKK) (approximately equivalent to €13 euros and to $17 USD)[105] per MWh – is set, and it should be guaranteed by a Green Fund, which is required to buy up the number of certificates necessary for fulfilling the national target, in case of non-compliance by obliged parties.[106] Consumers not fulfilling their obligation are required to pay fines to the Treasury Department.[107] Besides encouraging compliance, such penalties are expected to confer stability on the market by setting a maximum price for certificates.[108]

The Danish Energy Agency (DEA) is optimistic about the possibility of international trade, which would solve the problem of the small size of the national market, and consequently decrease the price volatility of certificates. However, the DEA has also underlined the need for transparency, harmonisation of national rules, and implementation of the "additionality" and "reciprocity" principles as essential conditions for a pan-European system.[109]

Since 1999, when the government announced the possible introduction of a TGC system, several lobbies have opposed the adoption of the new policy tool, arguing that it could delay or halt clean energy sources development.[110] As a result, a number of complex transitional rules are to be applied up to 2005, causing widespread uncertainty to potential investors and definitely inhibiting an increase in RES-E deployment. In particular, until the entry into force of the announced national TGC scheme, RES-E producers will receive the equivalent of €13 euros (equivalent to around $16.80 USD) per MWh as a compensation for not getting the equivalent certificate price. In addition to the above sum, wind power producers will receive a feed-in tariff worth around €3 euros per MWh (equivalent to $3.80 USD per MWh); similarly, biomass producers will get the equivalent of €13 euros per each megawatt of energy produced plus a feed-in tariff securing a

bevismarked-engelske-end.doc.

105. Like Sweden, Denmark did not adopt the euro as its national currency but kept the previous currency, which is the DKK.

106. *See* Danish Electricity Supply Act, Act No. 375 of 2 June 1999, 21 para. 65 (1999).

107. *Id.* at 21, para. 63.

108. See the criticism on the penalty issue made by KJAER, *supra* note 103.

109. Moreover, in 1999, the DEA pointed out a wide range of unresolved issues regarding the proposed TGCs scheme, such as the threat of unfair competition between renewable technologies, great uncertainty on price formation and on definition of minimum and maximum price, green pricing, and the setting of international trade. See N. I. Meyer & A.L. Koefoed, *supra* note 100, at 601–602.

110. *See* SOREN KROHN, DANISH WIND INDUS. ASS'N, AN INDUSTRY VIEW OF A PROPOSED DANISH GREEN CERTIFICATE MARKET—THE DEVIL IS IN THE DETAIL (2001), *available at* http://www.windpower.org/en/articles/busiview.htm.

price equivalent to €40 euros (equivalent to around $51.80 USD) per MWh (including the spot market electricity price).[111]

Unfortunately, over the last two years, the instable political environment has caused a dramatic drop in the Danish RES-E market.[112] Recent studies[113] have pointed out that the implementation of the Danish TGC system would avert the threat of a further decline in wind capacity growth, which might instead result from the prolonged use of current feed-in tariffs. Moreover, the creation of a pan-European TGC system is expected not only to favour the achievement of the Danish RES-E target under the E.U. Directive 2001/77/EC,[114] but also to turn Denmark into a relevant RES-E exporter to other E.U. Member States.[115]

V. CONCLUSIONS

This paper has expressed three main ideas. Firstly, it has been said that, in a liberalising energy market, TGCs seem the most promising mechanism to stimulate RE growth. In the long run, TGCs ensure the highest conformity with market principles by leading to cost minimisation and providing incentives for innovation.

Secondly, it has been argued that broadening the scope of TGC systems from the national to the international level would increase even further the advantages of such mechanisms. Indeed, a pan-European TGC system would encourage the cost-effective siting and development of renewables, reduce certificate price volatility, and facilitate the setting and achievement of national quotas by enabling countries with a shortage of TGCs to import certificates from countries with a surplus of them. Cost efficiency and coherence with market principles make TGCs preferable to alternative policy tools to the end of establishing an E.U.-wide framework for RES-E support, under the E.U. Directive 2001/77/EC.

Thirdly, standardisation of certificates issued at a State level has been recommended. Indeed, the description of national experiences (U.K., Sweden, Italy, Belgium, and Denmark) has shown that TGC systems can be designed in a variety of ways, reflecting physical and climatic circumstances as well as distinct political priorities. Yet, non-uniform national design parameters can have a detrimental effect on the functioning of a prospective E.U.-wide TGC system. Notably, provisions on technology definition, market stabilisation measures, and further RES-E incentive tools supplementing TGCs national-wise, need to be harmonised.

Given the infant state of all E.U. national TGC systems, very little experi-

111. *See* UYTERLINDE ET AL., *supra* note 31, at 87.

112. *See* COMM'N OF THE EUROPEAN CMTYS., COMMISSION STAFF WORKING DOCUMENT: THE SHARE OF RENEWABLE ENERGY IN THE E.U.: COUNTRY PROFILES: OVERVIEW OF RENEWABLE ENERGY SOURCES IN THE ENLARGED EUROPEAN UNION 20 (2004), *available at* http://europa.eu.int/comm/energy/res/documents/country_profiles/2004_0547_sec_country_profiles_en.doc.pdf

113. *Id.* at 89.

114. The Danish indicative target under the E.U. Directive 2001/77/EC is 29% of total power consumption by 2010. *See* Council Directive 01/77/EC, *supra* note 4, at Annex.

115. *See* UYTERLINDE ET AL., *supra* note 31, at 87.

ence has been gathered so far, and thus only some general theoretical suggestions for a better design of a pan-European scheme can be given. RES-E growth requires long-term, clear, and credible objectives. Hence, mandatory targets beyond 2010 should be promptly set.[116] Also, continuity and coherence between laws and regulations affecting related policy fields should be ensured.[117] In particular, the interface between TGCs and other measures, such as the Emission Trading system, should be anticipated.

In addition, since for most of the accession countries, it will be very difficult to achieve a significant increase in renewable capacity before 2010,[118] a "clustered Europe" scenario[119] could be implemented. In other words, a trans-national TGC mechanism could initially involve only first-movers and then be gradually extended to other Member States.[120]

Furthermore, an optimised design of a trans-national TGC system should incorporate some "flexibility mechanisms" aimed at reducing certificate price volatility and building up potential RES investors' security. Indeed, cross-border trading is likely to enhance the liquidity and stability of current TGC markets, but it would not be a panacea. Hence, limited banking and borrowing could be possible solutions against certificate price volatility in an E.U.-wide market, whilst a rolling redemption period together with uniform penalty levels would increase the overall effectiveness of the system.

Pursuant to art. 4 (2) (e) of the E.U. Directive 2001/77/EC, a pan-European TGC mechanism is unlikely to be implemented before 2012. Time is, therefore, available to find solutions to most of inherent and external problems, which might hamper the full integration of renewables into the European energy market slightly evolving towards liberalisation and internationalisation.

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116. *See also* EUROPEAN RENEWABLE ENERGY COUNCIL, RENEWABLE ENERGY TARGET FOR EUROPE: 20% BY 2020 (n.d.), *available at* http://www.erec-renewables.org/documents/Berlin_2004/targets/EREC_Targets_2020_def.pdf (last visited Jan. 15, 2005) (summarizing the outcomes of the European Conference for Renewable Energy "Intelligent Policy Options," held in Berlin on 21 January 2004, which ended with the unanimous conclusion to proceed without delay in setting new ambitious targets for 2020).

117. *See, e.g.*, the E.U. ENER-IURE project, whose ultimate aim is the establishment of general legal principles and specific legal instruments to promote RES growth in the E.U. by breaking down the existing barriers to their dissemination. For more information, visit the E.U. ENER-IURE project web page at http://www.jrc.es/cfapp/eneriure/welcome.html (last visited Jan. 15, 2005).

118. *See* UYTERLINDE ET AL., *supra* note 31, at 85 (pointing out a number of specific barriers present in CEE countries, such as the current overcapacity for conventional electricity generation, the fact that electricity prices are still being subsidized in some new Member States, and the absence of specialized financing mechanisms).

119. *Id.* at 60, 85–86.

120. The New Member States have considerable potential for developing renewable energy utilization. However, under the current market conditions, renewable energy investments are rarely competitive. Czech Republic, Estonia, and Slovenia have all introduced feed-in tariffs for stimulating renewable energy investments, but feed-in tariffs' levels are rather low in Estonia and Slovenia. From 2004, feed-in tariffs are guaranteed long-term in the Czech Republic. Estonia and Slovenia do not offer priority grid access to renewable energy generators. Estonia and the Czech Republic have no legally binding targets for renewable energy, whilst the Slovenian target is rather low. For further information, see REG'L ENVTL. CTR. FOR CENT. & E. EUROPE, ENVIRONMENTAL POLICIES AND LEGISLATION AND THEIR IMPACT ON ECO-EFFICIENT INNOVATIONS IN THE CZECH REPUBLIC, ESTONIA AND SLOVENIA 107 (2004), *available at* http://www2.vrom.nl/docs/internationaal/06a%20REC%20Final%20Report.pdf.