Proposition pour un critère non monétaire relié au développement durable

Témoignage de

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Pour le RNCREQ et le RRSE

Dans le cadre du dossier R-3525-04 de la

Régie de l'énergie

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RNCREQ.doc.-1
RRSE.doc.-2

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1 Qualifications

Quel est votre nom, titre et adresse d'affaires ?

Je m'appelle Philip Raphals. Je suis directeur du Centre Hélios, situé au 326 boul. St.-Joseph est, suite 100, Montréal, Québec, H2T 1J2.

Veuillez décrire le Centre Hélios.

Fondé en 1996, le Centre Hélios est un organisme de recherche à but non lucratif, offrant une expertise indépendante dans le secteur de l'énergie. Le Centre Hélios produit et rend disponibles les connaissances requises pour la mise en œuvre de stratégies, politiques, approches réglementaires et choix économiques favorisant le développement durable et équilibré du secteur énergétique.

Veuillez décrire votre expérience professionnelle pertinente à ce dossier.

Mon expérience est résumée dans mon Curriculum vitae, qui est joint à ce témoignage. Mes activités professionnelles ont touché un grand nombre de sujets reliés à la planification, la réglementation et la tarification des réseaux électriques. Ceux-ci incluent, entre autres, la restructuration des marchés énergétiques, les processus de planification, la réglementation du transport d'électricité, l'efficacité énergétique et la sécurité des approvisionnements dans un réseau hydraulique.

J'ai notamment exploré en détail l'interaction entre la compétition et la réglementation ainsi que les implications environnementales du commerce en électricité. Actuellement, je mène une étude majeure concernant la restructuration des marchés d'électricité en Amérique du nord pour le bénéfice de l'Organisation latino-américaine de l'énergie.

Un de mes champs d'expertise concerne l'hydroélectricité et l'environnement. Mon expérience comme coordonnateur scientifique adjoint du Bureau de soutien pour l'examen public du projet Grande Baleine m'a permis de connaître en profondeur les enjeux environnementaux et sociaux soulevés par un mégaprojet hydroélectrique et ce, dans le cadre d'une équipe professionnelle multidisciplinaire.

En 1999, j'ai rédigé conjointement avec Philippe Dunsky un rapport d'expert dans le cadre de l'audience R-3410-98 concernant les principes, méthodes et autres considérations applicables à l'attribution d'une quote-part à la filière de la petite production hydroélectrique.

En 2001, j'ai rédigé une étude majeure sur les interrelations entre la problématique de la restructuration des marchés énergétiques et la filière hydroélectrique, intitulée *Restructured Rivers :*

Hydropower in the Era of Competitive Energy Markets. Ce rapport était publié par International Rivers Network, avec l'appui de la fondation Packard.

Je préside le Comité aviseur sur les énergies renouvelables du *Low Impact Hydropower Institute* (LIHI) aux Etats-Unis et, à ce titre, j'agis comme membre non votant de son Board of Governors. Au Canada, j'ai participé activement à l'élaboration du projet de directive pour le programme canadien Écologo, notamment sur les aspects concernant l'hydroélectricité.

En 2002 et 2003, j'ai mené, de concert avec LIHI, une étude financée par le Fonds nord-américain pour la coopération environnementale (FNACE) sur le rôle de l'hydroélectricité dans les marchés d'énergie verte. Je présenterai cette étude au *World Renewables Energy Conference* à Denver en septembre prochain.

Avez-vous témoigné auparavant devant la Régie?

Oui, à plusieurs reprises. J'ai témoigné à titre d'expert dans les dossiers suivants : R-3398-98 (tarifs de fourniture), R-3401 (tarif de transport d'Hydro-Québec), R-3410 (avis sur une quote-part pour la petite production hydroélectrique), R-3470 (Plan d'approvisionnement d'Hydro-Québec), R-3473-02 (Plan d'efficacité énergétique d'Hydro-Québec), R-3518-04 (option interruptible) et R-3519-03 (coûts évités). J'ai également préparé un rapport d'expert dans le cadre des travaux de la Régie sur la demande du Ministre d'un avis relativement au projet Suroît (R-3526-04).

2 Mandat

Veuillez décrire le mandat que vous ont donné le RNCREQ et le RRSE.

Ces deux organismes m'ont demandé :

1. d'analyser la proposition du Distributeur à l'égard d'un critère non monétaire relié au développement durable et
2. de présenter une proposition alternative, s'il y a lieu.

3 Sommaire

La proposition du Distributeur ne répond pas aux exigences exprimées par la Régie pour un ensemble de raisons.

Nous proposons d'utiliser le Power ScoreCard comme point de départ. Il s'agit d'un système qui permet de donner une cote numérique aux centrales de production d'électricité de toutes les filières, sur la base des informations simples fournies par les producteurs. En l'absence de données précises, il applique des valeurs par défaut pour chaque filière et sous-filière.

Toutefois, l'approche retenue par Power ScoreCard pour la cotation des projets hydroélectriques n'a pas d'application en-dehors des États-Unis, parce qu'elle se base sur des éléments précis de la réglementation de cette filière aux É-U qui n'a pas d'équivalent au Québec ni ailleurs au Canada. Nous proposons donc de remplacer celle-ci par une nouvelle approche qui reflète les caractéristiques physiques des installations hydroélectriques. D'autres modifications sont également proposées pour rendre l'approche conforme aux exigences du présent contexte.

Ainsi, selon notre proposition, toute soumission sera évaluée selon les catégories suivantes :

1) Impacts sur l'air
   a) Émissions GES
   b) Émissions SOx
   c) Émissions NOx
   d) Émissions Hg

2) Impacts sur l'eau
   a) L'utilisation d'eau
   b) Impacts sur la qualité de l'eau

3) Impacts terrestres
   a) Utilisation directe des terres
   b) Impacts terrestres indirects

4) Impacts écologiques et sociaux

   a) Effets sur les espèces rares ou ménacées
   b) Ouveture des régions sauvages
   c) Effets sur les valeurs culturelles
   d) Besoins des infrastructures additionnelles de transport

De plus, des indicateurs spéciaux sont prévus pour la filière éolienne (l'évaluation des impacts terrestres) et hydraulique (pour tenir compte de l'entreposage, des débits réservés, des détournements, des passes de poissons et de la « virginité » du site).

4 Introduction

Dans sa décision D-2002-169, la Régie a demandé au Distributeur de proposer un critère non monétaire relié au développement durable qui :

> devrait inclure quelques indicateurs couvrant l'ensemble des filières probables qui seront évaluées en fonction d'informations de base simples à fournir par les soumissionnaires[1].

Le but du critère est de considérer les aspects sociaux et environnementaux des soumissions « de façon équilibrée »[2].

Cette demande, simple à décrire, reflète en réalité une tâche énorme : la conception de quelques indicateurs qui tiendront compte de l'ensemble des aspects environnementaux et sociaux de l'ensemble des filières de production d'électricité et qui permettront de les classer de façon fiable et équilibrée.

Il est clair cependant, d'après la décision D-2004-139, que la Régie ne voit pas le présent processus comme étant une cause générique sur le développement durable, et donc n'a pas l'intention de faire un examen approfondi de l'ensemble des enjeux environnementaux et sociaux soulevés par la production de l'électricité.

Dans ce contexte, nous avons priviligié une approche qui s'appuie le plus possible sur les efforts déjà faits dans d'autres contextes, en faisant bien sûr les modifications et ajustements nécessaires pour la rendre conforme d'une part au contexte énergétique québécois et, d'autre part, au contexte réglementaire où l'on se trouve, c'est-à-dire une grille de sélection pour utilisation dans le cadre d'un appel d'offres d'un Distributeur pour les approvisionnements à long terme.

5 La proposition du Distributeur

Dans leur ensemble, les critères proposés par le Distributeur ne rencontrent pas les exigences de la Régie, parce qu'ils ne couvrent pas l'ensemble des filières probables. En fait, quoiqu'ils distinguent

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1 D-2002-169, p. 72.

2 Ibid., p. 71.

entre les centrales thermiques en fonction de leurs émissions atmosphériques, ils ne permettent aucunement de distinguer parmi des projets hydroélectriques, ni parmi des projets éoliens, ni entre ces deux filières. Ainsi, il ne rencontre pas non plus l'exigence imposée par le Distributeur lui-même à l'effet que les indicateurs devraient permettre de distinguer entre les approvisionnements offerts au sein d'une même filière en fonction de la performance environnementale et sociale des centrales[3].

Il importe également de souligner que les critères proposés par le Distributeur, pris dans leur ensemble, ne répondent pas adéquatement au concept du développement durable tel qu'élaboré par la Commission Bruntland et des auteurs subséquents. Deux des quatres critères concernent des émissions atmosphériques, sans aucun critère pour faire état des divers impacts environnementaux et sociaux que peuvent également engendrer des projets énergétiques, tels que les déchets nucléaires, la destruction des habitats ou la perte de ressources nécessaires pour les activités de subsistance.

Citons à cet égard la Commission Bruntland :

> Modifier la qualité de la croissance, cela signifie aussi changer notre approche du développement pour tenir compte de tous ses effets. À titre d'exemple, un projet hydroélectrique ne peut être envisagé sous le seul angle de la production d'électricité ; il faut également s'arrêter à ses effets sur l'environnement local et sur les moyens d'existence des intéressés. Ainsi, l'abandon d'un tel projet pourrait être une mesure de progrès et non de régression, s'il s'agissait, notamment, de ne pas perturber un système écologique rare[4].

Finalement, le choix d'un critère basé sur l'existence d'un système de gestion environnementale de type ISO 14001 n'est appuyé par aucune étude démontrant que des producteurs d'électricité ayant une telle certification produisent des impacts environnementaux significativement moindres que ceux faisant appel aux mêmes technologies qui n'ont pas une telle certification[5]. En fait, certains observateurs voient cette norme comme un outil de gestion interne qui aide une compagnie à gérer des aspects de ses opérations qui affectent l'environnement sans nécessairement les réduire[6].

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[3] HQD-1, doc. 1, p. 6.

[4] Commission mondiale sur l'environnement et le développement, *Notre avenir à tous* (Éditions du Fleuve, 1988), p. 63.

[5] HQD-2, doc. 6, p. 6, Réponse 3.

[6] R. Krut et H. Gleckman, *ISO 14001 : A Missed Opportunity for Sustainable Global Industrial Development*, Earthscan Books (London : 1998), 158 p.

6 Cadre proposé — le Power ScoreCard

Dans la foulée de la restructuration des marchés d'électricité aux États-Unis, plusieurs nouveaux outils ont été développés pour tenir compte des aspects environnementaux de la production d'électricité. Quoique la plupart de ces outils ne peuvent s'adapter à un contexte d'appel d'offres, il y en a un, le Power ScoreCard, qui répond en grande partie aux besoins articulés par la Régie.

6.1 Fonctionnement

Le Power ScoreCard est un outil conçu pour permettre au consommateur individuel de comparer les profils environnementaux des choix énergétiques qui lui sont offerts dans le cadre d'un marché concurrentiel au niveau du détail. Il s'agit donc d'un contexte très différent de celui du Distributeur. Cela dit, il appert que cet outil peut s'adapter très facilement au contexte d'un appel d'offres au marché du gros.

Le problème auquel s'attaque le Power ScoreCard en est un de taille. Le consommateur individuel dans un marché ouvert a le choix entre un certain nombre de « produits », offerts par différents vendeurs, chacun de ces produits étant composé de l'électricité de plusieurs sources. Dans certains cas, les centrales d'origine seraient spécifiées, dans d'autres seules les filières de production le seraient, et dans certains cas il se peut qu'aucune information ne soit fournie concernant la source de l'électricité offerte.

Le Power ScoreCard a été élaboré par des experts du *Pace Law School Energy Project* de concert avec ceux d'autres organismes spécialisés en énergie et en environnement dont la *Union of Concerned Scientists*, la *Northwest Energy Coalition*, le *Natural Resources Defense Council* et *Environmental Defense.* Se basant sur huit critères distincts, il permet le calcul d'une cote unique chiffrée pour une centrale de n'importe quelle filière, en se basant sur des informations simples qui seront normalement obtenues des opérateurs. Dans le cas où des informations ne sont pas fournies, il utilise des cotes par défault selon la filière et la « sous-filière ». Une cote est également calculée pour l'énergie du réseau (*system power*)[7].

[7] Le Power ScoreCard fait également état de la proportion des « new renewables » dans chaque produit, mais cet aspect n'a pas de pertinence au présent dossier.

Le Power ScoreCard est maintenant en pleine fonction dans trois États ayant procédé à l'ouverture des marchés au détail, soit le Texas, la Pennsylvanie et le New Jersey[8]. Dans ces trois États, chacun des produits offerts au public a été coté, la cote étant la moyenne pondérée des cotes des centrales qui y contribuent. Dans les années à venir, le service Power ScoreCard sera probablement offert dans les autres États, ce qui permet au consommateur de choisir son fournisseur.

Dans la prochaine section, nous présentons un survol rapide des méthodes utilisées dans le Power ScoreCard. Pour plus de détails, se référer au document, *Power ScoreCard Methodology,* reproduit en annexe A.

6.2 Les indicateurs

Le Power ScoreCard cote les centrales selon la moyenne pondérée de huit indicateurs, décrits ci-dessous, qui représentent les impacts sur l'air, sur l'eau et sur la terre. Dans la pondération, l'indicateur GES est compté deux fois, pour refléter le jugement de ses concepteurs de l'importance accordée aux changements climatiques par rapport aux autres impacts environnementaux.

Malgré l'intention d'élaborer un cadre qui s'appliquerait de la même façon à n'importe quelle centrale de production, les concepteurs du Power ScoreCard ont réalisé qu'un système trop simpliste ne peut tenir compte adéquatement des impacts environnementaux distincts des différentes filières. Ainsi, certains indicateurs s'appliquent uniquement à la filière thermique, tandis que d'autres sont spécifiques aux filières éoliennes ou hydrauliques.

6.2.1 Les impacts sur l'air

Pour les émissions atmosphériques, les échelles sont généralement fixées en tenant compte de trois points de repère :

- aucun impact donne une cote de 0,

[8] Il a également été mis en place en Californie, mais l'ouverture du marché du détail a été terminée à la suite des événements bien connus des années 2000 et 2001.

- un impact équivalent au meilleur résultat disponible (après mesures d'atténuation) pour la production thermique donne une cote de 4, et

- un impact équivalent aux pires niveaux communément associés à la production d'électricité aux États-Unis (ex. les veilles centrales au charbon) donne une cote de 10.

Des échelles quantitatives sont généralement construites autour de ces trois points de repère, ce qui donne un rapport linéaire entre l'émission et la cote entre 0 et 4 et entre 4 et 10, mais pas nécessairement entre 0 et 10.

Les indicateurs utilisés sont les suivants :

- **émissions GES** : La cote est basée sur les émissions GES (en CO_2-équivalent) par MWh. Les émissions de méthane sont converties en les multipliant par 21. Une cote de 4 est fixée au niveau des émissions d'une centrale à cycle combiné à haute efficacité alimentée en gaz naturel (env. 350 kg/MWh). Une cote de 10 est fixée au niveau des émissions d'une centrale à charbon à faible efficacité (env. 1090 kg/MWh). L'échelle est proportionnelle entre 0 et 4 et entre 4 et 10, mais pas uniformément entre 0 et 10. L'effet est de le rendre plus sensible aux améliorations de performance au bas de l'échelle.

- **émissions SO_x** : Comme pour l'indicateur GES, l'échelle est calibrée en fonction des émissions d'une centrale à cycle combiné à haute efficacité alimentée en gaz naturel et des émissions d'une centrale à charbon à faible efficacité (env. 21 kg/MWh)[9].

- **émissions NO_x** : Encore une fois, l'échelle est calibrée en fonction des émissions d'une centrale à cycle combiné à haute efficacité alimentée en gaz naturel (41 g/MWh) et des émissions d'une centrale à charbon sans contrôle des émissions (env. 4,2 kg/MWh).

- **émissions Hg** : La cote de 4 est fixée au niveau des émissions d'une centrale typique au mazout (2,3 g/MWh), et la cote de 10 au niveau d'une centrale typique au charbon avec *dry particulate control* mais sans *flue gas desulfurization* (66,7 g/MWh).

[9] Étant donné que les centrales à cycle combiné à gaz naturel n'ont généralement pas d'émissions de SOx, l'échelle est modifiée pour permettre une différentiation entre des faibles niveaux d'émissions. Pour une explication détaillée, voir *PSC Methodology,* p. 8.

6.2.2 Les impacts sur l'eau

Pour les ressources thermiques, éoliennes et solaires, le Power ScoreCard évalue les impacts sur la qualité de l'eau sur la base de leur usage de l'eau et de leurs impacts sur sa qualité. L'usage est coté selon une échelle numérique en pieds cubes par seconde par MW installé.

Pour ce qui est de la qualité de l'eau, les impacts sont mesurés par rapport aux normes édictées selon la *Clean Water Act* américaine.

Les aménagements hydroélectriques sont cotés selon une méthodologie distincte, décrite plus loin.

6.2.3 Les impacts terrestres

Pour les filières thermique et solaire, le Power ScoreCard évalue séparément les impacts sur site et hors site. Les impacts sur site sont estimés en fonction des superficies requises (installation, entreposage de combustible et de déchets) par MWh d'énergie produite. On distingue entre les impacts facilement réversibles et ceux qui ne le sont pas, avec un multiplicateur allant de 0.25 pour les technologies renouvelables qui sont facilement enlevées (ex. photovoltaïque) jusqu'à 5.0 pour la filière nucléaire.

Pour ces mêmes deux filières, le Power ScoreCard évalue les impacts terrestres hors site en relation avec les volumes de déchets produits (avec un multiplicateur pour les déchets nucléaires) et avec un ajustement pour l'acquisition des combustibles, le cas échéant.

Pour la filière éolienne, le Power ScoreCard cote les projets en fonction de leur conformité avec sept critères établis avec la collaboration de l'industrie éolienne. Ces critères touchent les préoccupations suivantes :

- l'utilisation des terres,
- les sols et la topographie,
- l'accès aux régions éloignées,
- la végétation et les communautés biologiques
- la faune sauvage,
- les paysages, et
- les loisirs.

Les détails de ces critères se trouve à l'*Attachment* D, « Criteria for Site Scoring Wind Projects, » de l'annexe A.

6.2.4 Les centrales hydroélectriques

Afin de tenir compte de la complexité de l'évaluation des impacts environnementaux des projets hydroélectriques, le Power ScoreCard cote ces centrales en fonction, d'une part, du régime réglementaire selon lequel elles ont été autorisées et, d'autre part, selon leur obtention, ou non, d'une certification « faible impact » par le *Low Impact Hydropower Institute*.

Le Low Impact Hydropower Institute est un organisme sans but lucratif créé pour faciliter la participation dans les marchés d'énergie verte des producteurs hydroélectriques qui se distinguent dans la gestion écologique des aménagements existants. Pour obtenir sa certification, un promoteur doit démontrer que sa centrale rencontre des exigences précises à l'égard de huit aspects environnementaux, soit :

- débits réservés
- qualité d'eau
- migration et protection de poissons
- protection d'habitat terrestre
- espèces menacées
- protection des ressources culturelles
- protection des ressources récréo-touristiques, et
- ne pas avoir fait l'objet d'une recommandation de mise hors service.

Ainsi, la certification LIHI se base non pas sur la puissance installée d'un aménagement mais sur ses véritables caractéristiques environnementales. Il s'agit d'un processus ouvert et transparent, dans lequel la participation du public est encouragée.[10]

Dans le Power ScoreCard, des projets hydrauliques ayant reçu une telle certification reçoivent une cote de 4 pour les impacts aquatiques et terrestres. D'autres projets ayant été autorisés par la *Federal Energy Regulatory Commission* (FERC) depuis 1986, sont cotés 8 dans les deux catégories. Cette distinction se base sur le fait que la loi constitutive de la FERC a été modifiée en 1986 de façon à augmenter significativement le rôle des enjeux environnementaux dans sa prise de décision

[10] Des informations additionnelles sur le programme et les critères d'évaluation du LIHI sont disponibles au www.lowimpacthydro.org.

à l'égard de l'autorisation de projets hydroélectriques. Selon la *Federal Power Act,* telle que modifiée par la *Electric Consumers Protection Act* (ECPA) de 1986, la FERC doit :

> give equal consideration to the purposes of energy conservation, the protection, mitigation of damage to, and enhancement of, fish and wildlife (including related spawning grounds and habitat), the protection of recreational opportunities, and the preservation of other aspects of environmental quality[11].

De plus, certains projets fédéraux, qui ne sont pas soumis à la compétence de la FERC mais qui ont subi une évaluation environnementale de leurs opérations depuis 1986, sont également cotés 8 dans les deux catégories. Tout autre projet hydroélectrique est coté 10 (eau) et 15 (terrestre), pour tenir compte des impacts reliés à la création et à l'exploitation des réservoirs.

Comme nous l'expliquerons en détail dans la prochaine section, étant donné que l'approche de la cotation des projets hydroélectriques intégrés dans le Power ScoreCard dépend intimement du régime réglementaire américain, il serait impossible de l'adapter pour devenir utilisable dans le contexte québécois, même avec des modifications importantes. Ainsi, il nous appert nécessaire de remplacer complètement ce « module » du Power ScoreCard par une approche nouvelle.

7 Les modifications requises

Il est bien évident que le Power ScoreCard a été conçu dans un contexte et pour une finalité très différente de celui auquel nous sommes confrontés. Toutefois, il a été conçu avec une flexibilité qui permet facilement les modifications requises pour répondre à des contextes différents.

Comme nous l'avons vu, il est nécessaire de remplacer complètement le module sur la filière hydroélectrique pour permettre son application hors des États-Unis. Nous recommandons également l'ajout d'autres indicateurs qui s'appliqueraient éventuellement à d'autres filières.

Ces modifications seront discutées dans les prochaines sections.

[11] En vertu du Electric Consumers Protection Act, s. 4(e).

7.1 La refonte du module hydroélectrique

Comme nous l'avons vu, l'approche utilisée par le Power ScoreCard utilise des cotes par défaut pour les projets hydroélectriques qui sont assez élevées pour les aspects aquatiques et terrestres. Des exceptions sont prévues pour a) des projets fédéraux pour lesquels les régimes d'exploitation ont été réévalués au cours des dernières années, b) des projets ayant reçu une autorisation de la FERC depuis la révision de son mandat statutaire en 1986 et c) ceux ayant reçu une certification « faible impact » du LIHI.

Il est nécessaire de remplacer ce module du Power ScoreCard pour l'utiliser au Québec, parce qu'il est intimement liée au régime réglementaire américain à l'égard de l'hydroélectricité. Cela est vrai non seulement pour la catégorie « autorisation FERC après 1986 », mais également pour la certification « faible impact » du LIHI, comme l'explique l'extrait suivant d'un ouvrage antérieur du soussigné :

> [M]any of [the LIHI] criteria rely on "Resource Agency Recommendations." A "resource agency" is defined as "a state, federal or tribal agency whose mission includes protecting fish and wildlife, water quality and/or administering reservations held in the public trust."
>
> A "resource agency recommendation" is defined as the most environmentally stringent recommendation issued by a resource agency pursuant to a public legal or administrative proceeding. It is important to note that the "resource agency" definition includes a broad range of federal and state agencies but specifically *excludes* FERC, the agency responsible for licensing most hydro projects.
>
> While FERC takes resource agency recommendations into account in its licensing proceedings, its mission is not limited to resource protection. Thus, holding a valid FERC license does not in itself guarantee that a project will receive LIHI certification. Rather, certification requires compliance with the most restrictive recommendation issued by a resource agency, even if that recommendation was rejected by FERC. In this sense, the LIHI criteria can be thought of as a compromise between those who would argue that the judgement of the governmental licensing authority is all that matters and those who argue that environmental judgements must be made independently, without relying on any governmental agency. Ultimately, this compromise rests on the credibility of state and federal resource agencies in the U.S. and on their procedural safeguards, such as the right to due process and the right of appeal.
>
> Because the LIHI criteria are so firmly embedded in the American regulatory and procedural context, they cannot be transferred to other countries without considerable modification[12]. (notes de bas de page omises et soulignés ajoutés)

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[12] Philip Raphals, *Restructured Rivers : Hydropower in the Era of Competitive Markets,* p. 71.

7.2 Des pistes à suivre

Notre défi est donc d'élaborer un module pour les projets hydroélectriques qui pourrait s'intégrer dans le cadre général du Power ScoreCard et qui reflèterait le plus fidèlement possible les véritables impacts environnementaux des projets particuliers, tout en répondant aux exigences énoncées par la Régie pour un critère non monétaire du développement durable. Notamment, il est essentiel que de tels critères soient facilement évalués en fonction d'informations de base simple à fournir par les soumissionnaires[13].

Ce défi est d'autant plus important que les impacts environnementaux d'un projet hydroélectrique varient non seulement en fonction du site du projet mais également de sa conception et de son régime d'exploitation. Le Distributeur a affirmé, avec raison, que des indicateurs tels que la superficie des zones riches en biodiversité, les impacts d'activités de production sur les zones protégées et sensibles, la modifications du régime hydrologique ainsi que les impacts environnementaux qui en découlent, ou même la superficie de terrain nécessaire aux activités de production ne seraient pas utilisables, soit parce qu'ils sont trop vagues, soit parce que les coûts et/ou les délais d'évaluation seraient incompatibles avec le processus d'un appel d'offres.

Le Distributeur semble reconnaître que les critères qu'il propose seraient inadéquats pour distinguer les projets hydroélectriques entre eux, mais son survol des indicateurs (HQD-2, doc, 1, Annexe 1) n'en révèle aucun qui serait applicable dans le présent contexte. Il semble donc conclure qu'il serait impossible de définir des indicateurs capables de faire de telles distinctions à l'intérieur de la filière hydroélectrique dans le présent contexte.

Il existe cependant un grand nombre d'indicateurs non ambigus et/ou quantitatifs qui peuvent contribuer à faire de telles distinctions dans ce cadre. Déjà en 1999, le soussigné a soumis à la Régie un rapport d'expert qui proposait l'utilisation de quatre indicateurs pour distinguer entre les caractéristiques environnementales de projets hydrauliques de petite échelle, sur une base claire et facile à repérer. Plus spécifiquement, nous avions proposé l'utilisation de quatre critères :

- Le débit réservé, par rapport au débit moyen annuel,
- La longueur du tronçon de rivière court-circuité (en mètres),

[13] D-2002-169, p. 72.

- Le degré de « virginité » du site (état sauvage versus état pollué, industrialisé ou harnaché), et
- Le degré de régularisation de débits par des aménagements hydrauliques existants[14].

De ces quatre indicateurs, les deux premiers donnaient lieu à des pointages additifs, tandis que les deux derniers avaient une fonction multiplicatrice. Ensemble, ils donnaient lieu à un pointage unique entre 1 et 10[15].

Nous mentionnons cette approche non pas pour proposer son adoption dans le présent contexte, mais plutôt pour démontrer que cette problématique n'est pas nouvelle. Des questions semblables sont également soulevées dans le cadre de la conception des *Renewables Portfolio Standards* (RPS) qui essayent d'accepter des projets hydrauliques comme éligibles, tout en limitant cette éligibilité aux projets qui atteignent une certaine cible sur le plan environnemental.

Il s'agit cependant d'un défi majeur, soit celui de construire des indicateurs qui donnent une indication relativement fiable des réels impacts environnementaux et sociaux d'un aménagement hydroélectrique, en se limitant aux informations de base qui sont simples à fournir par les soumissionnaires et, implicitement, simples à évaluer de façon non ambiguë par le comité d'évaluation des soumissions.

7.3 Des indicateurs propres à la filière hydroélectrique

Quatre des huit indicateurs du Power ScoreCard reflètent des émissions atmosphériques (dont l'indicateur GES, qui se voit accorder un poids double), ce qui permet de distinguer de façon très précise entre différents types de centrales thermiques. Il inclut également quatre indicateurs touchant l'eau et les terres, qui ont pour but de tenir compte des autres impacts environnementaux. Toutefois, l'attribution des cotes selon ces derniers quatre indicateurs est plutôt qualitative, avec des poids relatifs qui reflètent ultimement les jugements de valeur de leurs concepteurs.

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[14] Raphals et Dunsky (1999). *L'attribution d'une quote-part à la filière de la petite production hydroélectrique : Principes, méthodes et considérations.* R-3410-98, 26 mars 1999, p. 37-40.

[15] Ibid., pages 44-45.

Il nous paraît évident que de nouveaux indicateurs qui reflètent les impacts environnementaux et sociaux de différents types d'aménagements hydroélectriques doivent nécessairement être de ce deuxième type. Ce constat découle d'une part de la très grande difficulté de quantifier les impacts environnementaux et sociaux engendrés par des aménagements hydroélectriques, et d'autre part des contraintes imposées généralement par le contexte d'un appel d'offres et plus spécifiquement par la décision D-2002-169.

Par exemple, un indicateur très important des impacts environnementaux d'un aménagement hydroélectrique concerne le degré auquel son régime d'exploitation à été optimisé pour favoriser la protection de l'environnement, par rapport aux valeurs économique ou énergétique. Il s'agit cependant d'un jugement complexe qui ne peut se faire qu'au cas par cas, sur la base d'une connaissance détaillée de l'aménagement ainsi que de son régime d'exploitation. Il serait donc impossible d'évaluer cette question en fonction d'informations de base simples à fournir par les soumissionnaires.

De la même façon, nous devons exclure un indicateur basé sur la perte des habitats de grande importance sur le plan biologique. Il nous semble impossible de développer un indicateur fiable de ce critère qui ne dépende pas d'un complexe jugement qui ne peut se réduire à des calculs basés sur les informations simples.

Il existe cependant plusieurs indicateurs qui reflètent les impacts propres à la filière hydroélectrique qui rencontrent ce critère. Par exemple :

Le niveau des débits réservés. Quoiqu'il existe d'autres outils plus sophistiqués qui ne peuvent s'adapter au présent contexte, il existe un outil dont la valeur scientifique est reconnue et qui permet d'évaluer l'adéquation des débits réservés dans les tronçons court-circuités sur la base d'informations simples. Il s'agit de l'approche Montana-Tennant, développée dans les années 1970 dans un climat froid qui ressemble, dans une certaine mesure, à celui du Québec. Il ne requiert qu'une seule donnée de base, soit le débit moyen annuel (DMA) du cours d'eau. Il évalue les débits réservés pour les périodes hivernale (octobre à mars) et estivale (avril à septembre) comme pourcentage de ce débit moyen annuel. Il permet ainsi de classer des débits réservés comme « passable », « bon » ou « excellent » de façon objective et relativement fiable, selon le tableau suivant :

Cote d'appréciation	**Régime recommandé (% du débit moyen annuel)**	
	octobre à mars	**avril à septembre**
crue ou maximum	200 %	200 %
fourchette optimale	60 à 100 %	60 à 100 %
remarquable	40 %	60 %
excellent	30 %	40 %
bon	20 %	40 %
passable (« *fair or degrading* »)	10 %	30 %
pauvre ou minimum	10 %	10 %
détérioration grave	< 10 %	< 10 %

Entreposage : Il n'y a pas de doute que, toute autre chose étant égale, les impacts environnementaux d'un aménagement hydroélectrique augmentent avec le degré de modification de débits. Ces impacts se font sentir tant en amont qu'en aval. Plus l'aménagement est conçu pour modifier les débits dans le temps, plus il doit être doté d'un réservoir important, avec tout ce que cela implique au niveau de l'inondation des terres et de la fluctuation des niveaux d'eau. En aval, plus les fluctuations des débits sont importantes et plus leurs rythmes se distinguent du régime naturel, plus les écosystèmes seront affectés.

On peut bien sûr aller loin dans l'élaboration des indicateurs qui refléteront ces différents aspects. Cependant, pour répondre aux besoins de simplicité, nous proposons seulement de faire état de la période d'entreposage qui est prévue dans la conception de l'aménagement.

Chaînes de réservoirs : Dans les grands complexes hydroélectriques, pour optimiser la production et donc le coût de revient, un réservoir en aval commence souvent au point de restitution du canal de fuite du réservoir en amont. Ainsi, l'aménagement utilise toute la hauteur de chute possible, mais avec des conséquences écologiques importantes. Quoique les impacts écologiques d'un seul réservoir demeurent souvent locaux — sauf s'il y a des espèces rares ou menacées en jeu —, les effets écologiques d'une chaîne de réservoirs sont beaucoup plus importants. Notamment, les espèces qui requièrent des habitats d'eau vive pour une ou plusieurs de leurs étapes de vie n'auront plus de place dans le bassin versant affecté.

Détournements : Des aménagements qui enlèvent l'eau de façon permanente d'un bassin versant pour la déverser dans un autre ont, toute autre chose étant égale, des impacts écologiques plus importants que ceux qui retournent l'eau au même cours d'eau.

« Virginité » : Un projet hydraulique sur une rivière déjà exploitée à des fins hydroélectriques ou autres et dont le débit est déjà régularisé en amont, ou la qualité de l'écosystème est autrement dégradée, n'a évidemment pas le même impact écologique que sur une rivière « vierge ». Aussi, la réfection de centrales existantes ou désaffectées aura également un impact différent, quoique difficile à généraliser. L'importance du facteur *virginité* de la rivière a d'ailleurs fait l'objet du rapport de la Commission Doyon[16].

Passe de poissons : Un effet incontournable des barrages est d'empêcher la libre circulation des poissons entre les régions en amont et en aval du barrage. Cet effet peut varier de nul à très important, selon le placement du barrage et la présence ou non des espèces migratoires. À la limite, lorsqu'il est question des espèces comme le saumon qui doivent migrer entre l'embouchure d'une rivière et ses cours supérieurs pour se reproduire, de tels blocages ont souvent mené à la disparition de la variété et à la mise en péril de l'espèce dans sa totalité.

Nous proposons donc l'ajout des indicateurs suivants, qui s'appliquent uniquement aux projets hydroélectriques :

Entreposage		
	aucun (fil de l'eau) journalier	0 2
	hebdomadaire	3
	saisonnier	4
	inter-annuel	6
	multiplicateur s'il fait partie d'une chaîne de réservoirs	1,5
Débits réservés (Tennant)		
	excellent	0
	bon	3
	passable	6
	pauvre	12
Détournements		
	aucun	0
	mineur	3
	majeur	6
"Virginité"		
	barrage existant, eau pollué et rives artificialisés	0
	deux des trois éléments présents	2

16 « [La Commission recommande que le MRN] exclue du programme de petites centrales les sites vierges à moins que des études précises et détaillées, ayant fait l'objet d'audiences publiques, ne justifient l'installation d'aménagements nouveaux selon les points de vue économique, social et environnemental » (recommandation n^{o} 70, page 604).

	un des trois éléments présents	4
	aucun des trois éléments présents	6
Passes de poissons		
	aucune espèce migratoire présente	0
	espèces migratoires présente, avec passe de poissons	3
	espèces migratoires présentes; aucun passe de poissons	6

7.4 Des indicateurs génériques

Cette réflexion sur la prise en compte des impacts environnementaux et sociaux de la filière hydroélectrique a également permis de constater quelques autres indicateurs importants qui ne font pas partie du Power ScoreCard. Il s'agit des indicateurs qui sont importants pour la filière hydroélectrique mais qui peuvent trouver une application dans d'autres filières également. Par exemple :

Effets sur les espèces rares ou menacées : les effets sur les espèces rares ou menacées est un enjeu important pour la filière hydroélectrique, mais il peut l'être pour d'autres filières également.

Effets sur les cultures autochtones : les effets sur les cultures ou sur les activités de subsistance autochtones est un enjeu majeur pour certains projets hydroélectriques, mais il peut l'être pour d'autres filières également, notamment la filière nucléaire.

Effets sur les valeurs récréo-touristiques : Certains projets hydroélectriques entraînent la perte de diverses valeurs récréo-touristiques, dont les loisirs d'eau vive et les paysages rustiques, ce qui peut avoir des conséquences importantes pour les économies locales. La question paysagère se retrouve également dans le développement de la filière éolienne et, dans certains cas, des autres filières.

Ouverture des régions sauvages : Lorsqu'un projet énergétique se fait dans une région sauvage, les impacts environnementaux et sociaux vont souvent au-delà de ceux causés directement par l'aménagement. Ceux-ci incluent également les conséquences de la construction de routes d'accès et l'ensemble des conséquences environnementales et sociales du fait qu'un territoire auparavant inaccessible devienne ouvert. Dans le cas du projet Grande-Baleine notamment, plusieurs considèrent que les impacts de ce type auraient été plus important que l'ensemble des impacts environnementaux et sociaux directs. Ce type d'impact pourrait aussi se produire dans le cas du développement des ressources éoliennes dans les régions isolées.

Besoins additionnels en transport : Lorsqu'un projet énergétique requiert la construction de nouvelles lignes de transport, les conséquences environnementales et sociales de celle-ci doivent être attribuées au projet ou aux projets qui les rende(nt) nécessaires. Il va de soi que cet impact est beaucoup plus important s'il requiert l'ouverture d'un nouveau corridor de transport, et non seulement l'ajout d'une nouvelle ligne dans un corridor existant. Notons que cet indicateur ne tient pas compte des coûts des modifications du réseau rendues nécessaires par le projet, coûts qui sont internalisés ailleurs dans la grille de sélection, mais seulement de leurs impacts environnementaux et sociaux. Cet indicateur risque de trouver une application surtout par rapport aux filières hydroélectrique et éolienne.

Nous proposons donc l'ajout des indicateurs suivants, qui peuvent trouver application dans à la filière hydroélectrique qu'à d'autres filières également :

Effets sur les espèces rares ou ménacées		
	aucune telle espèce présente	0
	présente, mais aucun impact appréhendé	2
	présente, mais impacts mineurs appréhendés	4
	impacts majeurs appréhendés	6
Ouverture des régions sauvages		
	aucune	0
	mineure	3
	majeure	6
Effets sur les valeures culturelles		
	aucun	0
	effets mineurs sur les valeurs autochtones ou récréo-touristiques	2
	effets majeurs sur les valeurs autochtones ou récréo-touristiques	4
	effets majeurs sur les valeurs autochtones et récréo-touristiques	6
Besoins additionnels en transport		
	aucune nouvelle ligne requise	0
	nouvelles lignes dans un corridor existant ou court nouveau corridor	3
	nouveau corridor majeur	6

7.5 Modifications requises aux autres indicateurs

7.5.1 Émissions GES

Le Power ScoreCard prend comme hypothèse que la filière hydroélectrique ne produit aucune émission de gaz à effet de serre. Cette hypothèse est valable seulement dans le cas des aménagements ayant peu ou pas de retenue d'eau (réservoir).

Dans le cas des aménagements hydroélectriques ayant de telles retenues d'eau, il existe de grandes incertitudes sur le plan scientifique à l'égard de la quantité de tels gaz qui sont émis. Ces émissions varient entre autres selon la superficie des réservoirs, le type de terrain ou de plans d'eau ennoyés pour les créer, la zone climatique, la profondeur du réservoir et probablement de la fréquence de sa fluctuation.

Notre dernier examen détaillé de cette question remonte à 2001, et nos conclusions se trouvent au chapitre 6 de l'ouvrage *Restructured Rivers,* cité auparavant, dont une copie se trouve à l'annexe B des présentes. Sans entrer dans ce débat d'experts, il importe de souligner que les chiffres mentionnés par le Distributeur semblent assez loin en-deçà de la réalité. Selon cette analyse, le taux d'émissions pour les aménagements hydroélectriques en milieu boréal se situe entre 75 et 90 kg/MWh.

Cela dit, aucune modification n'est requise à l'échelle retenue par le Power ScoreCard pour les émissions de GES. Cette échelle donne lieu à une cote de 1 pour les aménagements hydroélectriques ayant des réservoirs importants.

7.5.2 Mercure

Comme nous l'avons noté auparavant, le Power ScoreCard intègre une échelle quantitative pour les émissions atmosphériques du mercure, ce qui donne des cotes de 1 pour les centrales alimentées en gaz, de 4 pour celles alimentées en mazout, et de 6 à 10 (selon la technologie de contrôle et le type de charbon utilisé) pour celles alimentées en charbon.

Quoique la filière hydroélectrique ne crée aucune émission atmosphérique de mercure, elle peut dans certains cas être responsable de l'entrée de cet élément très nocif pour la santé humaine dans la chaîne alimentaire. Il s'agit du phénomène bien connu de la méthylation du mercure inorganique au fonds des réservoirs, due à l'augmentation de l'activité microbiologique qui suit l'inondation des terres.

Nous n'avons pas l'intention d'entrer, encore une fois, dans les débats d'experts sur la durée du phénomène ni de la possibilité de réduire sa portée par l'enlèvement de la végétation avant la mise en eau du réservoir. Cela dit, il nous semble évident que les aménagements hydroélectriques qui sont responsables dans une certaine mesure de l'entrée du mercure dans la chaîne alimentaire et donc de la possibilité d'intoxication de l'être humain ne devront pas recevoir un zéro sous ce critère. Il est cependant impossible de proposer une échelle quantitative à cet égard qui réponde aux exigences précitées. Nous proposons donc une échelle qualitative qui s'applique uniquement à la filière hydroélectrique, comme suit :

Mercure - augmentation de la biodisponibilité	
Aucun	0
Mineur	3
Majeur	6

7.5.3 Qualité de l'eau

Comme pour l'ensemble des critères applicable à la filière hydraulique, les critères du Power ScoreCard concernant la qualité de l'eau dépendent de la réglementation américaine. Nous proposons donc de le remplacer avec la structure suivante, qui réflète la même logique en se basant sur la réglementation applicable.

	COTE	
	Aucun incidence de non conformité	Avec incidence(s) historique(s) de non-conformité
Peu ou pas d'effluents	0	N/A
Effluents moins de 50 % du niveau permis par les normes en vigueur	2	4
Respect minimal des normes en vigueur	4	8
Autorisation spéciale requise	8	12

7.5.4 La cogéneration

Il existe plusieurs approches distinctes pour allouer les émissions et autres impacts résultant des centrales pour lesquelles une partie de la chaleur produite est utilisée pour des fins industrielles ou autres (cogéneration ou *combined heat and power*). L'approche utilisée par le Power ScoreCard est d'allouer les émissions en fonction de l'efficacité nette de la centrale avec et sans la récupération de la chaleur.

Une autre approche serait de déduire des émissions brutes les quantités qui sont évitées par l'utilisation de la chaleur. Toutefois, cette approche requièrt des informations beaucoup plus détaillées pour permettre une appréciation fiable de émissions évitées. Nous ne proposons donc pas son utilisation dans le cadre du présent dossier.

7.5.5 L'allocation des points

Pour intégrer les résultats de ce processus dans la grille de séléction des appels d'offres, nous proposons que, pour chaque soumission, le nombre de points alloué soit égal à :

$$\mathbf{P = (1-S/75)*X}$$

où

Σ représente la somme des cotes applicables,

75 représente approximativement la cote de la pire centrale au charbon,

X représente le nombre des points attribué à cet indicateur.

Ainsi, si 20 points sont réservés pour cet indicateur, une soumission dont la somme des cotes s'élève à 40 obtiendrait

$(1-40/75)*20 = 9,3$ points,

et une soumission dont la somme des cotes s'élève à 20 obtiendrait

$(1-20/75)*20 = 14,7$ points,

et une soumission dont la somme des cotes s'élève à 10 obtiendrait

$(1-10/75)*20 = 17,3$ points.

Il s'agit donc d'une échelle linéaire, allant de 20 points lorsque la somme des cotes est de zéro, à 0 points lorsque la somme des cotes est de 75 ou plus.

8 Sommaire des critères et échelles proposées

Dans cette section, nous résumons les critères du Power ScoreCard retenus, avec toutes les modifications et ajouts discutés dans les sections précédentes.

On doit constater que, pour un grand nombre des critères du Power ScoreCard, plusieurs nuances et exceptions sont déjà intégrées pour mieux refléter les perceptions des concepteurs quant aux véritables caractéristiques environnementales des différentes options. Nous laisserons la tâche d'expliquer ces nuances au directeur du Power ScoreCard qui sera présent aux audiences.

8.1 Sommaire des critères

I. Émissions atmosphériques

A. Émissions de gaz à effet de serre

COTE		lbs./MWh	kg/MWh
0	=	peu ou pas d'émissions	
1	<=	192	87
2	<=	385	175
3	<=	578	263
4	**<=**	770	350
5	<=	1096	498
6	<=	1422	646
7	<=	1748	795
8	<=	2074	943
9	<=	2400	1091
10	>	2400	1091

Voir la page 7 de l'annexe A pour des notes sur le traitement particulier des émissions GES de la biomasse.

B. Oxydes de soufre

COTE		lbs./MWh	kg/MWh
0	=	peu ou pas d'émissions	
1	<=	1,9	0,9

2	<=	3,7	1,7
3	<=	5,6	2,5
4	<=	7,4	3,4
5	<=	9,3	4,2
6	<=	18,6	8,5
7	<=	27,9	12,7
8	<=	37,2	16,9
9	<=	46,5	21,1
10	>	46,5	21,1

C. Oxydes d'azote

COTE		lbs./MWh	g/MWh
0		no NO_x emissions	
1	<=	0,02	9
2	<=	0,04	18
3	<=	0,07	32
4	<=	0,09	41
5	<=	1,93	877
6	<=	3,77	1714
7	<=	5,62	2555
8	<=	7,46	3391
9	<=	9,3	4227
10	>	9,3	4227

D. La mercure

1. Pour l'ensemble des filières autres que l'hydraulique

COTE		lbs./GWh	g/MWh
0	=	Zéro	
1	<=	0,001	0
2	<=	0,002	1
3	<=	0,003	1
4	**<=**	0,005	2
5	<=	0,033	15
6	<=	0,062	28
7	<=	0,09	41
8	<=	0,119	54
9	<=	0,147	67
10	>	0,147	67

2. Pour la filière hydraulique

Mercure - augmentation de la biodisponibilité	
Aucun	0
Mineur	3
Majeur	6

II. Impacts sur l'eau (autre que la filière hydraulique)

A. Utilisation de l'eau

COTE		cfs/MWh	cmh/MWh
0	=	pas d'utilisation de l'eau de surface	
1	<=	0,22	2,3
2	<=	0,44	4,6
3	<=	0,67	7,0
4	<=	0,89	9,3
5	<=	1,11	11,6
6	<=	1,33	13,9
7	<=	1,55	16,3
8	<=	1,77	18,6
9	<=	2	21,0
10	>	2	21,0

B. Impacts sur la qualité de l'eau

	COTE	
	Aucun incidence de non conformité	Avec incidence(s) historique(s) de non-conformité
Peu ou pas d'effluents	0	N/A
Effluents moins de 50 % du niveau permis par les normes en vigueur	2	4
Respect minimal des normes en vigueur	4	8
Autorisation spéciale requise	8	12

III. Impacts terrestres

A. Filières autres qu'éolienne et hydraulique

1. Utilisation directe des terres

a. Superficie utilisée

COTE	Superficie utilisée (acres/MWh)	
0		
1	<	$.5 \times 10^{-5}$
2	<	1.0×10^{-5}
3	<	1.5×10^{-5}
4	<	2.0×10^{-5}
5	<	9.6×10^{-5}
6	<	17.2×10^{-5}
7	<	24.8×10^{-5}
8	<	32.4×10^{-5}
9	<	40.0×10^{-5}
10	=>	40.0×10^{-5}

b. Permanence des impacts

Les prochains multiplicateurs s'appliquent à la cote d'utilisation terrestre pour refléter la permanence des installations:

Technologies renouvelables de très faible impact[17]	0.25
Centrales à la biomasse	0.50[18]
Biomasse certifiée soutenable	0.25
Filière thermique (fossile)	1.0
Nucléaire	5.0

2. Impacts terrestres indirects

a. Déchets solides

[17] Photovoltaique, solaire thermique *dish sterling*, éolien, géothermique et certaines centrales à la biomasse.

[18] Augmenter à 1,0 lorsqu'il existe un risque significatif d'impacts environnementaux relié à l'entreposage et au traitement des combustibles.

COTE		lbs/MWh	kG/MWh
0		Aucun	
1	<=	23,4	10,6
2	<=	46,8	21,3
3	<=	70,2	31,9
4	<=	93,6	42,5
5	<=	117	53,2
6	<=	140,5	63,9
7	<=	163,9	74,5
8	<=	187,3	85,1
9	<=	210,8	95,8
10	>	210,8	95,8

Lorsque le site d'enfouissement des déchets solides est équipé d'un *double liner*, la cote est réduite par 50 %. Un multiplicateur de 3,0 est appliqué aux déchets nucléaires, ce qui donne une cote de **30**.

b. Ajustement pour l'acquisition du combustible

Ajout de 4 pour les filières thermique (fossile) et nucléaire.

Multiplicateur de 0,5 pour les centrales à biomasse qui utilisent comme combustible des déchets qui seraient autrement destinés à l'enfouissement. [19]

Impacts terrestres de la filière éolienne

	Cote
Emplacement généralement souhaitable selon l'ensemble des sept critères établis avec la collaboration du *National Wind Coordinating Committee* et le *Appalachian Mountain Club*[20]	1
Emplacement partiellement souhaitable selon l'ensemble des sept critères OU le plein respect des directives élaborées dans un processus de concertation	3
Emplacement partiellement souhaitable selon cinq ou six critères, et non souhaitable selon aucun des critères	5
Emplacement partiellement souhaitable selon trois ou quatre critères, et non souhaitable selon aucun des critères	7
Tout autre projet éolien	10

[19] Les centrales utilisant comme combustible les déchets solides municipaux ne sont pas éligibles pour ce multiplicateur.

[20] Voir l'Attachment D de l'annexe A pour les explications détaillées.

IV. Impacts écologiques et sociaux

A. Applicable à l'ensemble des filières

Effets sur les espèces rares ou ménacées		
	aucune telle espèce présente	0
	présente, mais aucun impact appréhendé	2
	présente, mais impacts mineurs appréhendés	4
	impacts majeurs appréhendés	6
Ouverture des régions sauvages		
	aucune	0
	mineure	3
	majeure	6
Effets sur les valeures culturelles		
	aucun	0
	effets mineurs sur les valeurs autochtones ou récréo-touristiques	2
	effets majeurs sur les valeurs autochtones ou récréo-touristiques	4
	effets majeurs sur les valeurs autochtones et récréo-touristiques	6
Besoins des infrastructures additionnelles de transport		
	aucune nouvelle ligne requise	0
	nouvelles lignes dans un corridor existant ou court nouveau corridor	3
	nouveau corridor majeur	6

B. Applicable à la filière hydraulique seulement

Entreposage		
	aucun (fil de l'eau)	0
	journalier	2
	hebdomadaire	3
	saisonnier	4
	inter-annuel	6
	multiplicateur s'il fait partie d'une chaîne de réservoirs	1,5
Débits réservés (Tennant)		
	excellent	0
	bon	3
	passable	6

	pauvre	12
Détournements		
	aucun	0
	mineur	3
	majeur	6
"Virginité"		
	barrage existant, eau pollué et rives artificialisés	0
	deux des trois éléments présents	2
	un des trois éléments présents	4
	aucun des trois éléments présents	6
Passes de poissons		
	aucune espèce migratoire présente	0
	espèces migratoires présente, avec passe de poissons	3
	espèces migratoires présentes; aucun passe de poissons	6

8.2 *Allocation des points pour la grille de sélection*

Pour chaque soumission, le nombre de points alloué pour la grille de sélection est égal à :

$$\mathbf{P = (1\text{-}S/75)*X}$$

où

Σ représente la somme des cotes applicables,

75 représente approximativement la cote de la pire centrale au charbon,

X représente le nombre des points attribué à cet indicateur.

9 Discussion

9.1 *Critères quantitatifs et qualitatifs*

Avec les quelques exceptions notées auparavant, l'ensemble de nouveaux indicateurs proposés ici sont de nature qualitative. Quoiqu'il soit relativement simple de fixer les différents niveaux à distinguer pour chacun, le choix des points à attribuer ne l'est pas.

Notons cependant que, même dans son état original, le Power ScoreCard intègre également ce type d'indicateur. Prenons par exemple l'indicateur des impacts terrestres de la filière éolienne, qui donne une cote de 1, 3, 5, 7 ou 10, selon le degré de conformité avec nombreux critères de l'emplacement. L'échelle tient également compte de la participation du promoteur dans des processus de concertation (*collaboratives*), s'il y a lieu.

Il s'en suit que ces nouveaux indicateurs ne peuvent s'exprimer en fonction du nombre du mégawattheures produites. Est-ce que ce fait fausserait systématiquement les résultats ? Comparons, pour l'exemple, deux projets, un grand et l'autre petit, qui rencontrent tous les deux la norme « passable » de l'échelle « Tennant[21] », à l'égard des débits réservés. Étant donné que le grand projet va produire beaucoup plus d'énergie que le petit, devrait-on présumer que le tort causé par ses débits réservés limités serait moindre sur une base unitaire ? Pas nécessairement, et ce pour deux raisons. Premièrement, la différence d'échelle entre les deux rivières fait en sorte que les véritables effets de l'absence de débits adéquats seraient plus grand dans le cas du grand projet, étant donné qu'il affecterait plus d'organismes, plus d'espèces et une superficie et une variété plus grandes d'habitats. Deuxièmement, il faut également tenir compte de la rareté des grandes rivières et des écosystèmes qui en dépendent. Ainsi, le risque de faire du tort à des éléments naturels qui sont uniques augmente rapidement avec l'échelle du cours d'eau affecté.

Cela dit, on doit reconnaître que n'importe quelle échelle qualitative de ce type implique des questions de jugement qui ne peuvent prétendre à une fiabilité ni à une rigueur scientifique absolue. À notre avis, il est simplement impossible d'atteindre ce niveau de rigueur dans le présent contexte, qui ne permet aucunement le recours aux études poussées touchant les valeurs de la société. Face à l'impossibilité de quantifier de façon rigoureuse les impacts environnementaux et sociaux décrits ci-dessus, il ne reste que deux choix : faire des estimations raisonnables, ou les ignorer complètement. Il nous semble inévitable que ce soit la deuxième option qui fausserait le plus les résultats.

Pour mettre au point un outil qui donnerait une estimation raisonnable des impacts environnementaux et sociaux d'un projet énergétique, tel que requis par la notion du développement durable, il faut donc abandonner l'ambition de représenter parfaitement les véritables impacts de chaque projet. Ici, le parfait est sans aucune doute l'ennemi du bon.

Il importe de rappeler le niveau d'effort implicite dans le processus de planification intégrée de ressources (PIR), beaucoup étudié mais jamais mis en vigueur au Québec, à l'égard de la

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[21] Voir la page 14.

comparaison des impacts environnementaux et sociaux des différentes filières. Un grand nombre de méthodologies ont été développées dans le cadre de ce processus pour permettre une comparaison rigoureuse des pommes et des oranges, faisant appel aux sciences biologiques et humaines. Malheureusement, aucune de ces méthodologies ne peut trouver d'application dans le présent contexte.

Tout cela étant dit, la question demeure entière : quel poids doit-on donner à ces impacts qualitatifs par rapport aux impacts atmosphériques quantifiables ? Ultimement, c'est le jugement et les valeurs du décideur qui est reflété dans ce choix. Les poids qui sont implicites dans les échelles qui suivent représentent notre suggestion à la Régie, qui est bien sûr libre de les modifier à son gré.

9.2 Le traitement des centrales existantes

Pour la plupart de filières, le fait qu'une centrale existe déjà ou qu'elle sera construite afin de fournir l'énergie requise si la soumission est retenue ne fait aucune différence. Pour les centrales thermiques, par exemple, la presque totalité des impacts environnementaux et sociaux se sont produit en fonction de l'exploitation de la centrale en question, au fur et mesure qu'elle est opérée. Ainsi, si une centrale thermique n'est pas utilisée, ou est utilisée à régime partiel, la plupart de ses impacts diminueront ou disparaîtront en conséquence.

La situation est toute autre pour les centrales hydroélectriques, dont la plupart des impacts environnementaux et sociaux se font sentir en fonction de la construction de la centrale et non de son exploitation. Qui plus est, la mise en service et le démantèlement des barrages étant coûteux, techniquement complexe et jamais vu au Québec[22], on doit présumer que de telles installations, une fois construite, sont à toutes fins pratiques permanentes.

La filière éolienne ressemble à celle de l'hydraulique à l'égard du premier aspect, mais pas du deuxième.

Ces différences font en sorte que le traitement approprié lorsque l'énergie des centrales existantes fait l'objet d'une soumission varie selon la filière. Pour comprendre cette différence, on n'a qu'à examiner les résultats de l'appel d'offres A-02/01 du Distributeur. Cet appel d'offres a donné lieu à

[22] Aux États-Unis, un nombre croissant de barrages a été démantelé pour faciliter la remise des rivières à leur état naturel.

trois contrats, un sur la base d'une centrale thermique qui sera construite à Bécancour, et deux sur la base d'énergie produite par deux centrales existantes du complexe La Grande.

Dans le cas de la centrale de Bécancour, chaque kilowattheure produit en fonction du contrat créerait des émissions atmosphériques additionnelles, qui autrement ne seraient pas émises. Les deux contrats avec HQP, par contre, ne changent strictement rien par rapport au fardeau environnemental et social supporté par les Québécois. Le complexe La Grande existe déjà ; ses impacts environnementaux et sociaux ont déjà été imposés et ne seraient aucunement évités en l'absence des contrats.

Pour cette raison, il nous semblerait artificiel et inapproprié de coter la soumission d'HQP en fonction des véritables impacts environnementaux et sociaux du complexe La Grande. La consommation de cette énergie à titre post-patrimonial n'est cependant pas sans effets environnementaux. Historiquement, Hydro-Québec a toujours exporté de l'énergie vers les marchés américains, surtout les marchés de New-York et de la Nouvelle-Angleterre. L'utilisation de cette énergie à titre d'énergie post-patrimoniale au Québec implique nécessairement qu'elle ne serait pas exportée. Malgré le fait qu'Hydro-Québec n'indique jamais la source précise de ses ventes en électricité (la seule exception étant précisément ces deux contrats en fonction de A-02/01), dans la mesure où HQP est exportateur, ces contrats auront la conséquence inévitable de réduire ses exportations.

Ce constat nous mène à la conclusion que les véritables conséquences environnementales et sociales de ces contrats se basent sur les caractéristiques des centrales de production dans les marchés avoisinants, et non sur ceux du complexe La Grande[23].

La question devient alors : quelles énergies sont déplacées par les exportations d'Hydro-Québec, ou quelles énergies additionnelles seront produites pour permettre ses importations ? S'il s'agit des exportations aux heures de pointe, c'est probablement la production thermique au gaz naturel qui serait évitée. S'il s'agit d'importations dans les périodes hors pointe, l'énergie viendra probablement des centrales nucléaires et de celles au charbon, qui ont les coûts variables de production le plus bas.

[23] Si HQP est importateur net, comme c'est le cas aujourd'hui, les contrats auront l'effet d'augmenter ses importations. La conclusion est donc la même.

Heureusement, il n'est pas nécessaire de faire appel à ces nuances dans le contexte qui nous concerne. Dans la mesure où les appels d'offres du Distributeur sont pour l'énergie de base, il serait tout à fait approprié d'utiliser les caractéristiques environnementales du *system power* de l'un ou l'autre de ces deux réseaux. Nous proposons donc d'utiliser les caractéristiques moyennes du *system power* dans les réseaux de New York et de la Nouvelle Angleterre pour l'évaluation de toute soumission qui fait appel aux centrales hydroélectriques ou éoliennes déjà existantes.

9.3 Le traitement des soumissions du côté de la demande

Si, à l'avenir, des soumissions du côté de la demande font partie des appels d'offres du Distributeur, il faudra également leurs attribuer des points en vertu du critère non monétaire relié au développement durable.

Étant donné qu'une soumission basée sur la réduction de la charge ou de la consommation n'entraîne à toutes fins pratiques aucun nouvel impact environnemental, nous proposons de lui accorder une cote de zéro. Autrement dit, une telle soumission obtiendrait 100 % des points disponibles dans la grille de sélection.

9.4 Conclusion

Quoique le système d'évaluation proposée ici puisse à première vue apparaître compliqué, nous sommes d'avis qu'un certain degré de complexité est inévitable si l'on veut représenter fidèlement les impacts environnementaux et sociaux de l'univers des filières et de centrales distinctes. Cela dit, il s'agit néanmoins d'un système qui peut s'appliquer en fonction d'informations de base simples à fournir par les soumissionnaires. Soulignons que cette condition ne requiert pas une approche simpliste.

Nous croyons donc que toutes les informations requises pour mettre en application cette approche peuvent être obtenues des soumissionnaires par le biais d'un questionnaire inclus dans le document d'appel d'offres. Nous recommandons toutefois que les réponses à ces questionnaires soient rendues publiques pour l'ensemble des soumissions retenues. Si des informations fournies s'avèrent non véridiques, cela pourrait entraîner la disqualification de la soumission.

Finalement, il est important de souligner que cette structure a été élaborée en fonction de multiples contraintes qui sont propres au présent dossier. Son utilisation pour toute autre fin ne sera donc pas appropriée.

ANNEXE A

Power ScoreCard Methodology

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22 septembre 2000

Power Scorecard ä
Methodology

September 22, 2000

By

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NOTICE

PREFACE

The Power Scorecard is an education tool, developed and designed by environmental and educational organizations to enable consumers to purchase high environmental quality electricity services. The Power Scorecard provides overall environmental quality ratings as well as individual environmental impact ratings. This structure recognizes that while most consumers will be interested in the overall environmental rating, some consumers may want to learn how products rate on specific criteria that they value more highly than others.

The Power Scorecard Methodology Report describes the criteria used to rate the environmental quality of the electricity products offered in competitive retail markets. The basic rating criteria focus on eight environmental impact issues and the scoring metric associated with them, as well as the criteria for rating new environmentally preferred/renewable resource content. The Report also outlines a process for administering these criteria.

The Methodology is a dynamic tool. It will continue to evolve as the project sponsors learn from the experience of rating electricity products and as new knowledge about the environmental impacts of electricity production surfaces.

The rating criteria were developed by studying published information on the environmental impacts of electricity production and by consulting with experts in a variety of electricity production methods and environmental impact issues. The Power Scorecard sponsors and administrators continue to seek new information that will improve the quality of the ratings. While we expect this new tool to evolve over time, we recognize that the relative stability of the rating criteria is important. Suppliers must be able to enter into contracts for electricity purchases knowing that the criteria by which these supply commitments are judged can be counted on for reasonable periods.

The Power Scorecard is designed to balance the need for change with the need to provide a consistent signal to service providers. Accordingly, this edition of the Power Scorecard Methodology Report will be used for rating electricity products offered in Pennsylvania and California markets. We will collect and study information we obtain during this first year and consider necessary changes in the basic rating criteria using this new knowledge and experience.

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Power Scorecardã Methodology

Executive Summary

Flip that switch. We do it every day to power our lights, TV, stereo and in ever-increasing numbers, computers. Unlike the air we breathe or the water we drink, electricity that serves our basic human needs must be generated from a variety of fuels. And because most of this enormous system is not visible to us from the vantage point of our homes, it is easy to overlook the fact that generating electricity is the largest industrial source of pollution in the world, and that our own lifestyle choices and consumption patterns have an impact on the environment. Radioactive waste, global climate change, acid rain, declines in native fish populations, the scarring of once pristine landscapes to access fuel supplies – all of these environmental issues are linked to generating electricity.

Up until now, we had little choice about how much, or what kinds, of pollution our own electricity consumption generated. Decisions about which power plants to run or build were made for us by our local utility. We simply paid the bill. Today, growing numbers of consumers have a choice.

The electricity business is following in the footsteps of telecommunications, where consumers have had product and service choices for quite some time. Ultimately, all of us will have choice when it comes to power supplies. Even in electricity markets that remain regulated, incumbent utilities are often now offering premium electricity eco-products to their customers.

Many consumers and investors, if given the chance, will support the development of cleaner and greener power supplies. At least that is what public opinion polls have reported consistently over the years. However, the electric power industry is unique in its complexity, in its invisible omnipresence. We never actually see electricity, only the services it provides, and the gadgets this power source supports in our lives. The processes involved to generate electricity are engineering marvels whose details would baffle most consumers. Since monopolies have sold electricity throughout most of our lifetimes, we are not used to shopping for power. Consumers don't know who to trust in an era of competition among electricity offers.

In order to allow a real market to develop, consumers and investors need tools to cut through the noise, to understand the environmental implications of their power choices, in order for them to act on their preferences.

The Power Scorecard is that tool. *Power* Scorecard provides consumers with the means to directly compare the environmental characteristics of various power products through a one-of-a-kind rating methodology. It allows consumers to evaluate the environmental quality of specific products in direct head-to-head comparisons. Now we can get answers to basic questions that previously never seemed to get a straight answer: *Just how "clean" is the electricity I am buying? How good is that claim by one of those new* *power marketers that their electricity service is greener than what I am getting now? How bad can my current supply be?*

Here is how it works. The Power Scorecard grades, the relative environmental impacts of the fuel resources and technology employed to produce an electricity product. A lower score means that the product produces less pollution and therefore impact on the environment and human health is minimal. A high score means the opposite: the product creates more – not less – environmental impacts such as increasing smog or acid rain or degrades land and water supplies. The Power Scorecard offers an easy to understand "score" customers can then use to compare the environmental quality of electricity products before they choose to either switch to a new supplier or stay with their existing electric utility company.

The Power Scorecard evaluates the environmental impacts of the specific generating facilities used to produce a specific retail power supply product. It measures the performance of the product on eight environmental criteria: global climate change, smog, acid rain, air toxics, water consumption, water pollution, land impacts and fuel cycle/solid waste.

An overall environmental impact score for each electricity product is calculated as the weighted average of eight measured indices, where the index of global climate change impacts is counted twice, reflecting the greater importance *Power* Scorecard assigns to this global environmental impact issue relative to the other seven. In light of the environmental risks associated with the long-term storage of radioactive wastes, nuclear power plants will typically have a score exceeding ten in the category of land use impacts.

The Power Scorecard provides detailed information on each of the eight environmental criteria that underlie the final score so users can see clearly how the impacts of power supplies on air, water and land contribute to a final score. This allows a consumer to align products with their own values. For example, if your top concern is global climate change, Power Scorecard allows you to find the product that best responds to this particular environmental threat. Any electricity product, whether marketed as an environmentally superior product or not, can be ranked. Products will be labeled, Excellent, Very Good, Good, Fair, Poor, and Unacceptable.

Along with judging products according to the fuel and specific electricity generation technology employed, Power Scorecard also reveals what portion of the power product comes from new renewable supplies, the most important building blocks for a more sustainable energy future. Not only do new, clean sources of electricity provide significant environmental improvement over most current generating resources, but purchases from **new** low impact sources create the consumer demand necessary for even more new renewable resources to be constructed. Buying electricity from new renewable generation yields immediate and long-term environmental gains. The Power Scorecard can finally end confusion over exactly how much of your own electricity bill supports the new state-of-the-art clean power technologies of tomorrow. The Power Scorecard also identifies those electricity products that offer other environmental enhancements such as commitments to energy efficiency or purchases of pollution credits to offset the negative air emission impacts from specific power plants whose output is included in a power product.

Some power marketers are selling products that are actually dirtier than the generic mix your current incumbent provides. Power Scorecard can also be used to compare dirty power products, too. Whether focused on the clean or the dirty, the Power Scorecard simplifies the switching process by underscoring the difference in environmental impacts between renewable and non-renewable electric supply.

California and Pennsylvania are among the first states to open up electricity markets to competition. New York and many New England states are phasing in full-scale retail choice. User-friendly tools like the Power Scorecard empower consumers to consider the environmental impacts when exercising their opportunity of choice in electricity supply in these and other electricity markets in the near future. The Power Scorecard allows conscientious consumers to align their electricity supply with their own personal environmental values.

I. Introduction

The move to competition in the provision of electricity service will change the way consumers buy power. Early pilot programs, in which consumers were offered their choice of suppliers, revealed that they are very interested in the environmental quality of the electricity products offered and are often willing to pay a premium for *green* electricity. Electricity generation leaves a significant environmental footprint, emitting 66% of the nation's sulfur dioxide (SO_2), 29% of its nitrogen oxides (NO_x), 36% of its carbon dioxide (CO_2) and 21% of its mercury. [1] Appropriate and accurate marketing and good evaluation tools are necessary to make the offer of environmentally superior electricity products a credible venture. The *Power* Scorecard provides consumers the means to distinguish objectively the relative environmental quality of the electricity services they must choose among in these new competitive markets.

More than 40 state legislatures and utility regulatory agencies have begun to review the risks and benefits of deregulating electricity suppliers in their state -- allowing certified or licensed suppliers (not just regulated monopoly utilities) to sell electricity to customers at market prices (rather than regulated rates).[2] In several states, notably California, Massachusetts, Pennsylvania, Rhode Island, New Hampshire, New Jersey and New York, customers have already been offered the opportunity to choose a new electricity supplier.

Some power products are distinguished by the environmental quality of the power derived from renewable and other "clean" power resources. The sale of these supplies in states that have deregulated their power markets is commonly referred to as green marketing. Monopoly utilities offering "green" alternatives to traditional generation resources in states which have not yet adopted deregulation, are engaged in what is commonly known as green pricing.[3] The *Power* Scorecard,[4] asks a set of questions about the resources used to generate the electricity being sold, and scores those answers generally on a scale from one to ten. [5] The

[1] U.S. Environmental Protection Agency, 3/31/98.

[2] The transmission and distribution systems remain regulated; utilities continue to deliver electricity under regulated rates.

[3] Public Service Company of Colorado and several smaller utilities in Colorado, for example, are offering electricity from wind plants to consumers who subscribe to this "premium" service.

[4] This index was created by the Pace Energy Project under the guidance of an ad hoc group of national environmental organizations committed to encouraging consumers to use the power of choice in competitive retail electric markets to select environmentally superior service options. This group includes representatives from Environmental Defense, Northwest Energy Coalition, the Izaak Walton League, Union of Concerned Scientists, and the Natural Resources Defense Council.

[5] In some cases, scores may exceed a ten to reflect extreme deviations from the norm. Selling electricity is not the same as selling other commodities where customers expect to be delivered products manufactured by the producer with whom they have contracted. Electricity follows the laws of physics not the laws of contracts and no retailer can guarantee that

scoring scale was established by a group of environmental and energy experts and represents their best judgment about how to rank the answers provided by the energy suppliers. Default scores are provided for those situations where only fuel-type or technology is known. Overall *Power* Scorecard ratings are developed for products based on the proportion of the product's energy mix provided by each generating resource and the individual scores for each of those resources. Supplies or products with lower scores cause fewer adverse environmental consequences than those which rank higher on the scale. In an effort to make *Power* Scorecard understandable and manageable, the scoring process has been simplified as much as possible.

Objective measures of environmental impacts are key elements of the scoring, but *Power* Scorecard necessarily incorporates some judgment. Objective criteria are not available for measuring all impacts. *Power* Scorecard reveals the judgments it uses and discusses the basis on which those judgments were reached.

Power Scorecard augments the Center for Resource Solutions' *Green-e* and other certification efforts developed around the country by allowing consumers to distinguish among each of the supply options carrying a *Green-e* label as well as supply options that have not yet been certified. *Any electricity product, whether marketed as an environmentally superior product or not, can be ranked.*

Power Scorecard provides consumers with the means to compare the environmental characteristics of various power products. The promise of retail choice is the power of consumers to choose services they want. This tool allows consumers to evaluate the environmental quality of a supply, and balance that with other attributes of the offer -- such as price. Only if customers have the tools necessary to distinguish easily between the relative environmental quality of different products will consumer choice have the potential to reduce the environmental impact caused by the generation of electricity.

A. Two Measures of Environmental Quality

Power Scorecard provides two measures of the environmental quality for each electricity product: one to assess the environmental impacts of the electricity generating sources that serve consumers, and one to assess the contribution to displacing existing high impact electricity supplies with new low impact renewable and environmentally preferred supplies. For each of the two measures, products are assigned one of six ratings: unacceptable, poor, fair, good, very good, or excellent.

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electrons produced from any particular generator are actually delivered to any particular customer (unless the customer and the generator are the only two parties on the transmission system). Sellers nonetheless must obtain commitments from generators to produce electricity in sufficient quantities to serve their customers (or participate in a state or region-wide spot market or power exchange) in order that the state or region-wide electricity transmission system ("the system") is at all times balanced between production and consumption. An offer of electricity produced from a particular type of generation reflects the generators' commitment to be producing electricity for "the system" when the customers are using it ("the settlement period"). The Power Scorecard ranks the resources from which sellers have obtained these production commitments. *Power* Scorecard also ranks resources selling into spot markets and power exchanges to provide "market or system average" scores.

The Environmental Impact Rating

The *Power* Scorecard evaluation tool ranks the relative environmental quality of an electricity product. Supplies with lower scores have better environmental quality than those that rank higher. *Power* Scorecard allows consumers to compare products based on their environmental quality. *Power* Scorecard also allows suppliers to assess the relative environmental quality of alternative product designs and to assess the quality of offers made by their competitors. Its flexible structure enables *Power* Scorecard's use across the wide range of product designs providers may wish to offer.

The Environmentally Preferred New Renewable Content Rating

The *Power* Scorecard evaluation tool also rates products on the amount of new renewable or environmentally preferred energy included in their mix. Not only do new, clean sources of electricity provide significant environmental improvement over most current generating resources, but purchases from **new** low impact sources create the financial market necessary for even more new renewable resources to be constructed. Buying electricity from new renewable generation yields immediate and long-term environmental gains.

B. Outreach

The Pace Energy Project expects to make the *Power* Scorecard assessment of products available on the web in each of the states where consumer choice is provided. In addition, the environmental organizations that have guided the creation of this tool will be using it to advise their members of the environmental quality of available electricity products. *Power* Scorecard and related informational materials will be offered to other organizations to increase consumer awareness of the links between environmental quality and retail choice. A major education campaign on the value of buying environmentally superior electricity products is also planned.

C. Ingredients

An effective green rating program will have three major components:

1. transparent and objective environmental quality criteria and associated measures of performance;
2. a transparent and objective methodology for rating (i.e., scoring) service options against the environmental quality criteria;
3. an education program that communicates rating scores in easy-to-understand terms that will help consumers make smart retail choices.

Power Scorecard addresses the first two components and builds the foundation for the third -- consumer education programs that must be delivered in each electricity market to encourage consumers to analyze the choices available and to make responsible decisions.

The environmental qualities assessed by *Power* Scorecard are in those areas most seriously impacted by electric generation technology. They include:

Air quality	global climate change acid rain, smog, and fine particulate pollutants toxic mercury emissions
Water quality	consumption of water resources pollution of water bodies impacts on fish populations and other aquatic ecosystems
Land quality	impacts on land fuel cycle/solid waste disposal

D. Measures of Performance

Power Scorecard identifies eight criteria on which to measure a generating resource's air, water and land impacts and scores using a scale where zero represents no (deminimus) impact and a score of ten represents the high end of the range of impacts from current fossil fueled generation. Scores extend beyond the two ends of this scale when the magnitude of the impacts justify such scores.

As a general matter, scoring is calibrated using common references. A score of zero represents no (deminimus) impact. A score of four is assigned for those impacts that remain after pollution control or mitigation practices are incorporated to produce practically a very low emission rate from any fossil fuel technology. A score of ten is assigned to the high range of impacts associated with typical U.S. production of electricity.[6] On the scale for NO_x, for instance, a score of four is assigned to that level of emissions produced by a new, high efficiency combined cycle gas-fired facility and a ten for emissions expected from a coal plant lacking any NO_x controls. Measurement criteria that have two reference scores are linear from zero to four and from five to ten; all others are linear from zero to ten. This common scoring system allows environmental impacts to be compared across issue areas and technologies.

Power Scorecard provides scores for each of eight environmental impact criteria and, by combining these scores, offers an overall environmental impact score for each resource. The method for deriving total generation resource scores is discussed under "Scoring Environmental Impacts" below and the method for deriving total product scores is discussed in the "Product Scoring" section.

Currently our power comes from a number of different types of sources. *Power* Scorecard specifically assesses the following types of supply: thermal resources including geothermal, fossil-fuel and nuclear, and other resources including solar, wind, and hydro (see list of technologies addressed specifically in Attachment A). If other specific sources enter the market, Power Scorecard can be adapted to assess them as well.

[6] Certain facilities, or types of facilities, may produce impacts beyond the cluster of impacts exhibited by the vast majority of resources. These can score beyond a ten in certain areas as is discussed, *infra*.

Thermal, solar, wind and hydro facilities are scored on the same air quality criteria. All dual fuel and multi-fuel thermal supplies receive a composite score based on production, historic or projected, from each fuel type.

Thermal, solar and wind facilities are ranked on the same water criteria.

Thermal and solar resources are ranked on the same land criteria.

Hydro is ranked on site-specific water and land criteria, while recognizing that hydro plants produce no air emissions.

Wind is ranked on site-specific land criteria, while recognizing that wind plants also produce no air emissions.

E. Scoring Environmental Impacts

The manner in which the air, water and land scores for a facility are combined to derive a single generating resource score reflects a choice of environmental priorities on which to evaluate electric generating facilities. While objective measures of environmental impacts are key elements of most of the scoring, *Power* Scorecard necessarily incorporates judgment. Objective criteria are not available for measuring all impacts precisely. Nevertheless, these impacts exist. *Power* Scorecard reveals the judgments it uses in these cases and discusses the basis on which those judgments were reached.

An overall environmental impact score for each electricity product is calculated as the weighted average of eight measured indices, where the index of global climate change impacts is counted twice, reflecting the greater importance *Power* Scorecard assigns to this global environmental impact issue relative to the other seven.[7]

F. Significantly Greater Adverse Environmental Impacts

Facilities evidencing impacts greater than those typically receiving a score of ten can be given higher scores by using the increments evident in the zero to ten scale. For example, certain coal facilities emit SO_2 at rates that are approaching 40% more than emissions of facilities that scored a ten for the SO_2 index.[8] Nuclear power plants have significantly greater land impacts, and pose significantly greater long-term environmental risks than do plants receiving a ten score and are scored appropriately in land categories.

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[7] *Power* Scorecard gives a double weight to global climate change impacts while giving a single weight to the other seven environmental impact criteria. Climate change is the subject of an international convention and a pending emissions reduction protocol sponsored by the United Nations. Emissions of greenhouse gases threaten the global climate system, posing significant risks for ecosystems and human social systems. While other impacts are large and significant, this threat warrants extra weight.

[8] Emissions of 66 lbs/MWH of SO_2 would score twelve on the SO_2 scale (scores are rounded up).

G. Demonstrable Environmental Mitigation

Marketers wishing to improve the score of their power products may take steps to mitigate the environmental impact of the power they are selling. The scoring credits a number of such enhancements, including commitments to: 1) invest in new, low-impact renewable energy technologies 2) retire emission offsets or 3) mitigate the effects of water withdrawal on aquatic ecosystems, as for example, flow reduction, (re)location and (re)design of intake structures, fish deterrent devices (e.g., ultrasonics), fish return systems, or native fish restocking programs. Other enhancements may be reported by suppliers but are not now addressed by the scoring: a commitment to provide energy efficiency services is an important example. These enhancements may contribute significantly to the environmental value of services to consumers, in effect mitigating the environmental impacts captured in the scoring. Such unscored environmental enhancements may be addressed in qualitative observations provided when the scores are reported.

Suppliers of products with enhancements such as these are invited to list them in the product scoring process.

Power Scorecard will be revised to address important enhancements. Recognizing products that make a significant commitment to helping consumers take full advantage of energy efficiency opportunities will be among the first such changes in *Power* Scorecard.

II. Air Quality Impacts

Air quality is assessed by measuring four types of emissions:

Carbon Dioxide -- CO_2 -- to assess Global Climate Change impacts;
Sulfur Oxides -- SO_x -- to assess acid rain, smog and fine particulates impacts;
Nitrogen Oxides -- NO_x -- to assess acid rain and smog impacts;
Mercury to assess the impact of air toxics.

Power Scorecard allows users to consider the effects of emission offsets on The Score (explained below).

A. CO_2 Emission Rate and Score

The scoring for CO_2 emissions is calibrated to award a score of four for emissions typical of a high-efficiency combined-cycle natural gas fueled power plant, currently the most effective application of fossil fuel technologies. Plants that burn other fuels may have implemented pollution controls required by regulations but still not meet this level of emissions, which is estimated to be 770 lbs. CO_2/MWH. A score of ten is given for a coal plant with high emissions since this signifies relatively low combustion efficiency.[9]

[9] See Significantly Greater Adverse Environmental Impacts, *supra,* for discussion of scoring beyond a ten.

The diverse group of fuel types and fuel processing technologies that make up the category of "biomass" complicates scoring CO2 for biomass-fueled plants. It is also complicated by the interaction between a facility's emissions, the avoided releases of greenhouse gases if the fuel is instead left to decompose, and CO_2 sequestering inherent in repeated regeneration of biomass fuels.

The global climate change impact score of biomass is based upon the net impact of the fuel source on global climate change agents (CO_2 and methane emissions). The measurement criteria used here represent our first, best efforts at correctly accounting for the multiple greenhouse gas implications of biomass as a fuel. As we learn more, this scoring will be refined. Initially we will employ the following scoring guidelines:

1. Projects using a biomass fuel supply that is certified as coming from "sustainable sources" will qualify for zero net emissions and receive a score of zero. This anticipates the creation of a "sustainable fuel source certification" akin to the recently developed Low Impact Hydropower certification managed by the Low Impact Hydropower Institute.
2. Projects using a biomass fuel supply that is not certified as sustainable, but for which there is a reasonable basis for believing they are being replaced (e.g., energy crops), or projects that use clean waste that would otherwise be landfilled or burned in the open and which come from working forest or agricultural operations where biomass is being replanted (although not necessarily being replanted for use as a fuel), would receive a global climate change score of 2.
3. Projects in which there is no evidence that the biomass is being replaced, but which are avoiding methane release, would obtain a global climate change score of 4 (examples: wood from clearing land for commercial or urban development). Although the climate change effect of avoiding methane emissions may be zero or positive, such projects are only given partial credit because the fuel source is removing previously sequestered carbon.
4. Projects with no evident carbon equivalent benefits would score 10 (for example, biomass being removed for commercial development without being replanted).

Construction and demolition waste (clean C&D wastes) will be placed in category #3 above (avoided landfill) or in category #4 depending on the circumstances.

In the case of landfill gas to electricity projects, a further adjustment is made to account for the valuable displacement of unflared methane for facilities that utilize previously (within the previous twelve months) unflared landfill gas (methane). These resources score a negative four on this criterion.[10] Landfill gas to electricity projects utilizing previously captured or flared methane score zero.

[10] On a pound for pound basis, unflared methane imposes twenty-one times the climate change impact than does CO_2. On a per MWH of electricity basis, when burning methane that would otherwise be released from a landfill into the atmosphere, a landfill gas fueled electric generator typically avoids the equivalent of 10,000 to 15,000 lbs of CO_2 per MWH. In effect such a landfill gas fueled electric generator is offsetting far more CO2 emissions per MWH of electric generation than is emitted from coal plants or any other common form of electric generation.

The scale is proportional from zero to four and from five to ten, but not over the full zero to ten range. The effect is to make the scoring sensitive to smaller performance increments at the low end (below four) than at the high end (above four).

SCORE		LBS./MWH
0	=	no or trace CO_2 emissions
1	<=	192
2	<=	385
3	<=	578
4	**<=**	**770 -- reference score**
5	<=	1096
6	<=	1422
7	<=	1748
8	<=	2074
9	<=	2400
10	**>**	**2400 -- reference score**

This scoring produces the following representative CO_2 emission rates for common thermal electricity generating technologies:

PLANT TYPE	CO_2 EMISSIONS LBS./MWH	SCORE
Solar (PV)	0	0
Hydro	0	0
Wind	0	0
Nuclear	0	0
Natural gas fueled combined cycle plant	770	4
Oil fueled steam electric plant	1,770	8
Oil fueled combustion turbine	2,190	9
Coal fueled steam-electric plant	1,960-2,310	8-10
Solid waste generic facility	2,900	10

B. SO_x Emission Rate and Score

The SO_x emission score[11] is calibrated to the emissions expected from a high efficiency combined cycle natural gas fueled power plant (none or negligible emissions) and the ten score is set at the level of emissions expected

[11] The scoring system evaluates actual emission rates. Emission offsets authorized and verified can be incorporated outside of The Score (see Product Scoring discussion, *infra*).

from a coal plant using high sulfur coal without any flue gas desulfurization equipment (46.5 lbs. SO_x per MWH of output).[12] A six increment scale is created using the maximum output of 46.5 lbs.; scores five through nine are assigned five of those increments and scores one through four divide the remaining sixth into four equal increments. This allows differentiation in scores between zero and four as SO_x emissions approach zero.

SO_x at high concentrations can cause temporary breathing impairments for asthmatics. It is also a precursor to fine particulate matter (emissions particles less than 10 micrometers in size), which can penetrate deep into the lungs. Fine particulates are strongly associated with chronic lung disease and cause regional haze, reducing visibility. Sulfur Dioxide also causes acid rain, which can kill lake-resident plant and fish life, affect forests and cause outdoor corrosion.

SCORE		LBS./MWH	
0	=	no or trace SO_x emissions	
1	<=	1.9	
2	<=	3.7	
3	<=	5.6	
4	<=	**7.4**	**-- reference score**
5	<=	9.3	
6	<=	18.6	
7	<=	27.9	
8	<=	37.2	
9	<=	46.5	
10	>	**46.5**	**-- reference score**

The scoring produces the following representative SO_x emission rates for common thermal electricity generating technologies:

PLANT TYPE	SO_x EMISSIONS LBS./MWH	SCORE
Solar (PV)	0	0
Hydro	0	0
Wind	0	0
Nuclear	0	0
Natural gas fueled combined cycle plant	0	0
Biomass	0.1	1
Oil (2.2 % sulfur) fueled steam electric plant	25.4	6
Oil (0.3 % sulfur) fueled combustion turbine	4.4	3
Coal fueled steam-electric plants		

[12] See Significantly Greater Adverse Environmental Impacts, *supra*, for discussion of scoring beyond a ten.

1.	steam-electric	46.6	10
2.	integrated gasification combined cycle	1.3	1
3.	atmospheric fluidized bed combustion	4.6	3

C. NO_x Emission Rate and Score

Nitrogen Oxides (NO_x) scoring is calibrated to award a score of four to the emission rate for a high efficiency combined cycle natural gas fueled power plant (0.09 lbs. NO_x/MWH) and a score of ten is assigned to emissions at the level of a coal plant lacking emissions controls (9.3 lbs. NO_x/MWH).

NO_x play a major role in the formation of ozone, which is of particular concern to asthmatics. Ozone is a strong irritant associated with decreases in lung function, lung tissue damage, and chronic lung and heart disease. It also damages crops and forests.

The scoring system is proportional from zero to four and from five to ten and produces the following scoring for NO_x :

SCORE		NOX EMISSIONS - LBS./MWH
0	=	no NO_x emissions
1	<=	0.02
2	<=	0.04
3	<=	0.07
4	**<=**	**0.09 -- reference score**
5	<=	1.93
6	<=	3.77
7	<=	5.62
8	<=	7.46
9	<=	9.3
10	>	**9.3 -- reference score**

This scoring produces the following representative NO_x emission rates for common fossil fuel based electricity generating technologies:

PLANT TYPE	NO_x EMISSIONS-LBS./MWH	SCORE
Solar (PV)	0	0
Hydro	0	0
Wind	0	0
Nuclear	0	0
High efficiency natural gas		

combined cycle plant	0.09	4
Generic natural gas fueled combined cycle plants	2.5-3.8	6-7
Biomass (varies with level of control)	1.7-3.9	5-7
Oil fueled steam electric plant	3.0-3.7	6
Oil fueled combustion turbine	3.7-6.8	6-8
Coal fueled steam-electric plants		
X steam-electric	6.1-9.4	7-10
X integrated gasification combined cycle	0.45-0.60	5
X atmospheric fluidized bed combustion	3.0-3.8	6-7

D. Mercury Emission Rate and Score

Mercury emissions are not routinely monitored but the tendency for a plant to emit mercury can be reasonably predicted based on fuel type and pollution control technology. The scoring for mercury is calibrated by setting the mercury emission rate for oil-fired plants at four and the mercury emissions from lignite-fired plants with dry particulate control but lacking flue gas desulfurization ("FGD") equipment at ten.[13] Although the mercury content of coal is extremely variable, even within the same coal source, the large difference between the mercury content of coal and other fossil fuels provides the basis for the following scoring:

SCORE		LBS./GWH
0	=	zero
1	<=	.001
2	<=	.002
3	<=	.003
4	**<=**	**.005 -- reference score**
5	<=	.033
6	<=	.062
7	<=	.090
8	<=	.119
9	<=	.147
10	>	**.147 -- reference score**

This scoring produces the following representative mercury emission rates for common fossil fuel based electricity generating technologies:

[13] See Significantly Greater Adverse Environmental Impacts, *supra*, for discussion of scores beyond ten.

TECHNOLOGY	SCORE
solar (PV)	0
wind	0
hydro	0
nuclear	0
gas-fired steam-electric plants	1
oil-fired steam electric plants	4
bitumen coal w/ FGD and particulate controls	6
bitumen coal with dry particulate controls	7
lignite coal with FGD and particulate controls	8
lignite coal with dry particulate controls	10

Mercury emitted from solid waste facilities has often been several times greater then mercury emissions from coal plants scoring a ten on this scale. . New Federal emissions standards for waste to energy plants, “Maximum Achievable Control Technology” standards, require substantial reductions in mercury emissions from waste to energy plants by 2001. The impact of these new standards is under review and will be reflected in the table of default scores provided in Attachment A as soon as possible. As is the case generally, any electricity supply source will be scored on the basis of actual performance characteristics when that information is made available for scoring.

E. Emission Offsets

Power Scorecard has been designed to allow inclusion of emission reduction credits in the form of an adjusted score, though it will not change the ranking associated with actual plant emissions.[14] Emission reduction credits are created under emissions trading programs. *Power* Scorecard will show the effects on air emission scores of the retirement of valid emission reduction credits that are not otherwise required by any regulation. To demonstrate validity, the credit must be fully fungible and registered in either a state or federal or federally-approved registry. Credits can be in the form stipulated by the program - for instance, SO_2 allowances in the case of the acid rain program.

Though at least three formal processes are at work to develop a standard for early CO_2 reduction credits, no standard program yet exists.[15] When such a standard is established, a specific methodology will be adopted to allow scoring for CO_2 offsets which will require that the offsets be readily verifiable, measurable, not be

[14] The development of emission offset policies is in the early stages of development; *Power* Scorecard will treat them flexibly. Three key principles will guide the approach: (1) the offsets must be verifiable; (2) the treatment must ensure that offsets are not double counted (i.e., credited to both the source and the purchaser); and (3) they must contribute to benefits that exceed the minimum emission level required by federal and state regulation.

[15] There is a voluntary greenhouse gas registry established by Section 1605 B of the Energy Policy Act, but it does not ensure that the estimates of greenhouse gas offsets are measured consistently and does not provide a reliable means for verifying the accuracy or likely longevity of the offsets.

double counted by another source, and be permanently retired.

There is an emissions trading program for SO_2 which is referred to as the acid rain program. The program established an emission cap and allocated that cap to affected utility sources. Each allowance has a unique serial number and can be freely used for the duration of the program once it has been activated (a certain number of allowances are activated each year). At the end of each year, affected sources have to surrender an amount of allowances that equals their actual SO_2 emissions. If they have any allowances remaining, sources can bank them for future use. If a source decides to retire certain allowances expressly for the purpose of mitigating the air impact of the power it is generating, the retired emissions will be credited against their actual emissions for the parenthetical scoring purposes. For example, if a source held 200 allowances but only emitted 150 tons it would have to surrender 150 allowances and would then bank the remaining 50 or trade them to another source. If those 50 tons, instead, were retired for the purpose of mitigating the impact of power generation, then the source could adjust its score to show and additional 50 tons of reduction in emissions.

There is one NO_x emission cap and trade program being implemented in the Northeast and another proposed for 23 jurisdictions in the East. There are several other state initiatives to allow NO_x trading for RACT and New Source Review compliance. Because of the nature of smog formation and the role of NO_x, *Power* Scorecard would only adjust scores for the retirement of NOx allowances associated with the cap and trade programs. Adjustments would be done in similar fashion as in the case of SO_2.

The adjustments to the air quality scores that result from considering such credits will be reported with the scores in parentheses, but will not change the score or ranking associated with actual plant emissions. This information will allow users to see the score based on actual emissions but also to consider results of additional retirement of tons.

III. Water Quality Impacts

Water quality impacts of thermal, wind and solar electricity generation are scored using the same criteria; scoring for geothermal plants and hydro plants is done separately as discussed below. Water quality impacts of thermal, wind and solar electricity generation are of three principle types:

1) *Thermal Impacts* - the discharge of heat to the adjacent water body
2) *Usage Impacts* - chiefly impacts on aquatic species caused when large quantities of water are withdrawn from the lakes, rivers and other water bodies (e.g., entrainment and impingement of organisms in plant cooling systems)
3) *Chemical Impacts* - the discharge of chemicals used in, or created by plant operations.

A. Thermal, Wind and Solar Generation Rating Methodology

Power Scorecard assigns *usage impact* scores to generation resources based on the amount of water used per/MWH and *chemical impact* scores on the stringency of a plant's effluent limits and its compliance record with those limits. Impacts related to thermal discharge are not separately assessed as they are, by and large, site specific, and dependent to a great degree on the characteristics of the water body into which the effluent is discharged. In addition, significantly adverse impacts due to thermal discharge often result from isolated incidents. Longer-term impacts are correlated with cooling system technology, and captured, for the purposes of *Power* Scorecard, in the measure of water use.

1. Usage Impacts

Impacts on aquatic species caused when water is withdrawn from lakes, rivers and other water bodies (i.e., impingement and entrainment) are correlated strongly with the amount of water utilized. This in turn depends on a power plant's capacity, fuel source and cooling technology. Nuclear plants use the most water for cooling, coal plants use somewhat less, and oil- and gas-fired generation plants use even less.

A score of zero is awarded to plants that use no water and a ten for water use equivalent to a 1000-MW nuclear boiling water reactor. Scores between zero and ten reflect the amounts of water utilized by the prototypical generating plants, expressed as "cubic feet/second/MW" to allow for individual plant differences.[16]

A one point adjustment to the score is available if the plant operator has built in or retrofitted the facility with "qualified mitigation measures" such as flow reduction, (re)location and (re)design of intake structures, fish deterrent devices (e.g., ultrasonics), fish return systems, or native fish restocking programs to ameliorate impingement and entrainment impacts. The flat one point adjustment is offered because no method has been developed to assess the relative value of different combinations of these mitigation measures.

A linear scoring system using these end points produces the following scale:

SCORE		cubic feet per second per MW
0	=	no surface water consumption
1	<=	0.22
2	<=	0.44
3	<=	0.67
4	<=	0.89
5	<=	1.11

[16] The cubic feet per second per MW is the per MW volume of water used per second of operation at the plant's design capacity. It provides a reasonable basis for comparing the rates of water use by different plants. Natural gas fueled combined cycle technology does not provide an effective reference for the "four" score for water. In the case of thermal plants, the amount of water used is determined by the way the cooling system is designed, not the fuel type. The water scores are, therefore, distributed evenly between the zero and ten reference scores.

6	<=	1.33	
7	<=	1.55	
8	<=	1.77	
9	<=	2.00	
10	>	2.00	***-- reference score***

This scoring produces the following representative intake scores for common fossil-fuel electricity generating technologies:

<u>PLANT TYPE</u>	<u>SCORE</u>
Solar (PV)	0
Wind	0
gas-fired steam electric with cooling towers	1
Biomass facilities[17]	1
oil fired steam electric with once-through cooling[18]	6
coal fired steam electric with once-through cooling[19]	8
nuclear	10

2. Chemical or Water Quality Impacts

Power plants release a number of compounds that threaten water ecology and human health. As described below, the *Power* Scorecard rating of water quality is based on the level of pollution control the facility operator is required to meet: 1) in relation to the industry norm; and 2) the environmental requirements of the adjacent water body. Our scoring system further differentiates power plants on the basis of their track record of compliance with applicable standards.

Benchmark score: Under the Clean Water Act, the U.S. Environmental Protection Agency sets effluent limits for various "categories or classes" of point source polluters. Categorical standards have been established for steam electric power plants (40 CFR 423.12) These effluent limits, based on the best practicable control technology, are written into the power plant operators' NPDES permit. Power plants subject to, and in compliance with, all applicable effluent standards receive the benchmark score of "4". If they are out of compliance with their effluent limits, they receive an "8".

Variance score: Power plant operators can obtain a variance from one or more of the categorical effluent limits if they can demonstrate to EPA's satisfaction that the power plant in question is fundamentally different from

[17] Based on conversations with industry experts we conclude that biomass plants are very unlikely to utilize once-through cooling. As a default we are assuming cooling towers are utilized

[18] Based on a water use rate of 1.36 cu.ft/second/MW.

[19] Based on a water use rate of 1.62 cu.ft./second/MW.

the prototypical plant upon which EPA's standards are based. Among the recognized bases for receiving a variance is age and size of the plant, raw materials, plant processes, energy requirements and costs. Because variances are granted on the basis of technological and not ecological differences, *Power* Scorecard treats plants receiving a variance less favorably. Thus, these facilities are scored a "6" if in compliance, and are scored a "8" where out of compliance.

Water Quality score: In addition to the technology-based standards, environmental regulation may impose, on a case-by-case basis, more stringent standards where necessary to protect the designated use of the water body (e.g., cold water fishery, public water supply, recreation, etc.). Thus, plants failing to meet these water quality based standards receive a less favorable score (Score = 10) on the theory that they impose extraordinary impacts on the environment.

SCORE	EFFLUENT STANDARD	COMPLIANCE
0	no discharge	
4	subject to standards at least as strict as categorical standards for steam-electric generation point sources and	in compliance
6	subject to effluent standards that are (in any respect) less stringent than categorical standards and	in compliance
8	Subject to effluent standard no more stringent than categorical standard and out of	compliance with any one effluent limit;
10	subject to water quality standards that are more stringent than categorical standards (reflecting need to protect local ecosystems) and	out of compliance;

B. Geothermal Scoring Adjustments

An effectively designed and operated geothermal generating plant is extremely benign, producing negligible adverse environmental impacts. Nevertheless there are may be significant environmental impacts, especially water quality impacts, that must be addressed in their design and operation.

The risks of impacts on water resources are associated with processing the geothermal resource itself, i.e., the geothermal fluids or steam. Binary cycle technologies are closed loop systems and, therefore, when operating properly, do not impact water resources or related ecosystems. Flash system technologies may result in the releases of significant quantities of geothermal fluids, depending on the effectiveness of the plant design at capturing and re-injecting geothermal fluids back into geothermal zones of the Earth's crust. The long-term impact of geothermal plant operations on the quality and quantity of local ground water supplies is a significant water quality issue in some regions.

Until a better method is developed, *Power* Scorecard will assign four penalty points to both water use and water quality scores for any geothermal generating facility that is contributing significantly to the deterioration of the quality and quantity of local ground water supplies. This will be assessed on a case by case basis, an approach that may be practical because there are only a limited number of geothermal projects in each market area.

IV. Land Quality Impacts

Land quality is assessed for both on- and off-site impacts. On-site impacts result from ecological consequences of the facility itself, on-site fuel storage and waste handling. Off-site impacts include waste disposal, and the mining, processing and transportation of fuel.

Wind and hydro facilities are scored using site-specific criteria, as discussed *infra*.

A. On-Site Land Impacts: Thermal and Solar Generation

On- site land impacts are inherently specific to each plant. In light of our inability to measure such specific impacts at the outset, we use a proxy and measure the amount of land used per kilowatt-hour (of annual plant output) for the facility and its on-site fuel storage and waste disposal. A permanency factor is assigned to differentiate generating technologies with easy to reverse land impacts from those that pose comparatively difficult to reverse on-site land impacts

1. Land-use/megawatt-hour

Base scores are assigned from zero to ten depending on acreage required for the facility and for its on-site storage and disposal systems ("inside the fence") per megawatt/hour of output. The ten score reflects the land needed for a facility imposing one of the largest footprints, a biomass facility running at a 60% capacity factor. The 4 score represents the mid-point between acres required for a new combined cycle natural gas plant and an older natural gas steam plant. Scores are spread between 0 and 4 and 4 and 9 in equal increments.

SCORE	ACRES/MWH (OF ANNUAL OUTPUT)	
0		0
1	<	$.5 \times 10^{-5}$
2	<	1.0×10^{-5}

3	<	1.5×10^{-5}
4	<	2.0×10^{-5}
5	<	9.6×10^{-5}
6	<	17.2×10^{-5}
7	<	24.8×10^{-5}
8	<	32.4×10^{-5}
9	<	40.0×10^{-5}
10	=>	40.0×10^{-5}

2. Permanency of impact

A permanency factor is applied as a multiplier to the base land score. The multiplier is based on qualitative judgments about the reversibility of impacts, and differentiates among

i) fossil fuel technologies which are assumed to have similar impacts associated with power plant and fuel handling facilities,

ii) wind and solar technologies which can be easily and quickly removed,

iii) biomass plants whose operation requires large amounts of land for fuel storage and processing, but impose very few long-lasting environmental risks to the site, and

iv) nuclear facilities which produce significant, difficult-to-reverse impacts and whose environmental and public health risks are qualitatively different from other generation sources.

Fossil fuel plants are assigned a permanency multiplier of one (1.0). Solar and wind facilities, which can be removed easily and quickly, are assigned a permanency multiplier of 0.25. Biomass fueled facilities will have a default permanency weight of 0.5.

For plants whose biomass fuel is source is certified as sustainable, a permanency weight of 0.25 will be assigned. *Power* Scorecard is developing appropriate biomass scoring. As a first effort we differentiate between fuel sources that are sustainable and/or replaced and those that are not. No certification for "sustainable biomass" is available now, but several organizations are planning the development of such a certification. *Power* Scorecard recognizes the value of creating such a certification by offering a better rating for plants that may qualify.

A permanency factor of 1.0 can be assigned where there is evidence of significant risk of environmental impact from fuel storage and processing related to operations.

Nuclear plants leave long-lived and risky on-site impacts that are much more significant and risky than the land-use impacts of fossil facilities.[20] The Nuclear Regulatory Commission permits owners of nuclear plants to defer the dismantling of the facilities for up to 60 years. In addition, it is possible that spent nuclear fuel

[20] The fuel cycle impacts from fuel extraction, processing and transportation that support nuclear generation are addressed under Off-Site Land Impacts, Fuel Acquisition Adjustment.

could be stored on-site for as long as 100 years. And there is disagreement between the NRC and the Environmental Protection Agency as to the level of residual radiation that can remain on-site following decommissioning. Furthermore, the operation of nuclear power plants entails a small but potentially catastrophic risk to surrounding communities from the release of radioactive materials.
For these reasons, we assign a multiplier of 5 to nuclear generation. This measure of nuclear power's on-site land impacts may understate the impact and risk to surrounding communities. It is a preliminary approach.

To summarize, technologies are assigned the following permanency multipliers:

very low impact renewable technologies[21]	0.25
biomass plants	0.50[22]
certified sustainable biomass	0.25
fossil fuel combustion technologies[23]	1.0
nuclear technologies	5.0

Applying the multiplier to the on-site land scores produces the following land use scores:

TECHNOLOGY	SCORE	**FINAL SCORE** (BASE SCORE) X (PERMANENCY)
Rooftop Solar PV	0	0.0
Gas combustion turbine	6	6.0
Natural gas combined cycle	3	3.0
Oil, steam electric	4	4.0
Coal, generic	5	5.0
Biomass (default)	10	5.0
PV, dedicated site	56	14.0
Geothermal	5	2.5

[21] Very low impact renewable technologies include: photovoltaic, dish sterling solar thermal, wind, geothermal, and certain qualifying biomass plants.

[22] Where there is evidence of significant risk of environmental impact from fuel storage and processing related to certain biomass plant operation the permanency factor may be increased to 1.0

[23] Power providers rating their generating resources individually have an opportunity on the Generating Resource Score sheet to explain where, in this categorization, their resource fits if different from these estimated characterizations.

B. Off-Site Land Impacts: Thermal and Solar Generation

Power Scorecard addresses the off-site land impacts by adding the scores for i) solid waste and ii) fuel acquisition (i.e., mining, processing and transportation) impacts. Solid waste impacts are scored on the basis of net pounds of solid waste generated per MWH. Scores for fuel acquisition impacts are fuel-based and simply differentiate between renewable technologies, various types of biomass facilities and fossil fuel/nuclear resources.

1. Solid Waste Impacts

Solid waste disposal can adversely impact groundwater and land (for on-site or off-site landfill purposes). Land used for, and groundwater impacts from, solid waste impacts are measured by pounds of waste produced (and disposed of) per megawatt/hour.

The nine score for solid waste impacts is based on the tons of waste produced by a coal facility using flue gas desulfurization (FGD). Coal and biomass facilities create the most significant amount of solid waste but differ among themselves by size (MW), capacity factor, plant efficiency, fuel type and use of flue gas desulfurization (FGD).[24]

Solid waste impacts are scored on the basis of net pounds of solid waste generated per MWH per year to account for reuse of ash and FGD by-products.

SCORE	LBS OF SOLID WASTE GENERATED/MWH (NET)	
0		none
1	<=	23.4
2	<=	46.8
3	<=	70.2
4	<=	93.6
5	<=	117.0
6	<=	140.5
7	<=	163.9
8	<=	187.3
9	<=	210.8
10	>	210.8

The mitigation of groundwater impacts is captured by reducing by half the solid waste score for sites equipped

[24] The New York State Externalities Study indicates coal plants with FGD produce 200 lbs./MWH/year. Coal plants without FGD systems produce 115 lbs./MWH/year. This is in contrast to an oil plant which produces only about 60 lbs/MWH/year of solid waste.

with a double liner conforming to state/federal guidelines.[25]

Nuclear plants produce comparatively small volumes of high-level and low-level radioactive wastes. When measured only on a volume/megawatt hour, nuclear power would score relatively well on solid waste impacts. However, there are a succession of risks inherent in nuclear waste, each of which could rate a severe (i.e., 10) impact score. These risks include;

i. High-level radioactive waste
ii. Low-level radioactive waste
iii. Proliferation risks
iv. Transportation risks

Both high-level and low-level radioactive wastes cannot be easily managed or disposed. There is currently no location to permanently dispose of the high-level radioactive waste contained in spent nuclear fuel pools and it is unlikely that this issue will be resolved in the next decade. Any site would have to demonstrate that radioactive waste could be isolated from the biosphere for at least 10,000 years. There is only one location that is accepting low-level radioactive waste from nuclear power plants throughout the country (Barnwell, South Carolina) and the future availability of this site is in question. Given the high level of uncertainty about how these wastes will be managed, there is the need to assign a multiplier to the solid waste impact for nuclear power. We will assign a multiplier of 3 to nuclear solid waste, leading to a total score of **30**. This represents a very conservative estimate of the relative impact of radioactive waste compared to other forms of solid waste.

This scoring produces the following representative solid waste scores for common generating facilities. No credit for double lined disposal facilities or waste reuse has been incorporated in these scores.

SCORE	TECHNOLOGY
0	solar (distributed and central station PV)
1	natural gas combined cycle
1	geothermal
2	oil fired steam electric
4	coal plant without flue gas desulfurization
10	coal plant with FGD
30	nuclear

2. Fuel Acquisition Adjustment

Power Scorecard adds a fuel acquisition score to the solid waste score for all thermal and solar technologies to produce an off-site land score. Fuel acquisition is scored by assigning either a zero or a four. Fossil fuel

[25] Groundwater contamination from leachate can be significantly contained with double lined containment systems. The common elements found in leachate, which can produce adverse impacts if unlined containment systems are used, are discussed in The Green Rating Report.

and nuclear facilities receive a score of four to reflect fuel cycle impacts not imposed by renewable resource based technologies -- i.e., the environmental impacts associated with fuel mining, processing and transportation. Coal acquisition impacts include the land use impacts of both strip mining and underground mining, the impacts of coal cleaning, crushing, and the impacts of coal transportation from the mine to power plant. Oil acquisition impacts include the impacts of oil drilling, refining and transportation (including accidental spills). Natural gas acquisition impacts include the impacts of gas drilling and pipeline construction and operation. Nuclear fuel acquisition impacts include those associated with fuel mining, processing, and transportation.

Power Scorecard also distinguishes between biomass facilities that generate solid waste and those that reduce the need for solid waste disposal. For those biomass plants that produce electricity from biomass fuels that would otherwise be landfilled, we will use a fuel cycle adjustment multiplier of 0.5 applied to the total solid waste score[26]. This factor reduces the solid waste score for qualifying biomass facilities by half, in recognition of the environmental benefit obtained by producing valuable electricity from biomass wastes that would otherwise be destined for landfill disposal.

We acknowledge that assigning a single score for the acquisition impacts of most fossil fuel technologies and nuclear generation does not recognize the variations that exist among these technologies. Refinements to distinguish the range of fuel cycle impacts among various fuels, unfortunately, are unavailable. Cross-fuel data sets that measure impacts consistently are also not currently available. Determinations of fuel cycle impacts require complicated, difficult analysis. The US Department of Energy and the European Community, with the technical assistance of Oak Ridge National Laboratory and Resources for the Future, used seven volumes to report their detailed assessment of the environmental costs of total energy fuel cycle costs. Published fuel cycle information is not readily transferable for use in this rating system.

In addition, impacts on air and human health are necessarily very sensitive to the geographic location and the technology at the site. Yet generic information offers only very gross assessments. Probabilistic analysis of accidents, public health and biological risks that are associated with the total coal and natural gas cycles are unavailable.

It is clear, however, that fossil and nuclear generation impose fuel acquisition impacts that renewable resources do not, and therefore it is necessary to incorporate this differentiation into the scoring system.

C. Land Impacts: Wind and Hydro Generation

To create land scores that differentiate among wind and hydro facilities, these two technologies are scored

[26] Plants burning municipal solid waste (MSW) are not eligible for the waste reduction multiplier. MSW used as fuel for generating electricity adds adverse environmental impacts as compared with simply landfilling the waste. Other means of MSW handling produce better environmental impact outcomes, as for example recycling recoverable materials and composting organic materials.

with site-specific criteria. Scoring the land impacts of these technologies with the same scales used for thermal plants would distinguish them from the thermal technologies. Using these same criteria, however, would not create meaningful distinctions among hydro facilities or among wind facilities and would not account for the multiple uses that these sites (as opposed to thermal plant sites) are capable of hosting.

1. Land Impacts of Wind Generation

Power Scorecard rates the land impacts of wind plants by measuring the extent to which the facilities have been sited pursuant to criteria for suitable siting. The criteria for scoring wind generation are summarized here.

LAND IMPACT SCORE FOR WIND TECHNOLOGIES	CRITERIA
1	Wind facility mostly suitable on seven siting criteria OR wind facility developed and fully compliant with applicable state- or region-wide wind power development guidelines developed through collaborative, multi-stakeholder process and acknowledged as suitable by state environmental siting officials
3	Wind facility mostly or moderately suitable on seven siting criteria OR site developed pursuant to and fully compliant with a collaborative, multi-stakeholder settlement process
5	Wind facility mostly suitable in five or more categories, not least suitable in any
7	Wind facility mostly suitable or moderately suitable in three or more categories; not least suitable in any
10	Wind not scored above.

Attachment D explains these criteria.

2. Land and Water Impacts from Hydro Generation

The land and water scores for hydro are either tied to metrics that embody the diverse range of hydro plant impacts, or scores are tied to the characteristics of ownership and last license that reasonably represent these diverse impacts. Among hydro's more significant impacts are:

i) *fish impacts* - dams may interrupt upstream and downstream movement of fish and other aquatic life

ii) *river flows* - dams may interrupt traditional river flows necessary to maintain aquatic habitat
iii) *water quality* - dams may impose thermal and nutrient stratification
iv) *land use* - dams may destroy habitat

Hydro facilities qualifying as "Low Impact Hydropower" score a fo ur.[27] Low Impact Hydropower facilities successfully meet the low impact certification criteria established by the Low Impact Hydropower Institute.[28] Low Impact Hydropower facilities impose fewer adverse aquatic and terrestrial impacts by using environmental protections for fish, river flows, water quality, habitat mitigation and recreational opportunities. The Low Impact Hydropower Institute's criteria and certification process are described in Attachment C.

Most other hydro facilities' scores are based on ownership and the date of their most recent Federal Energy Regulatory Commission operating license. Because facilities owned by non-federal entities that do not qualify as low impact hydro but have been relicensed by FERC since 1986 generally have better environmental conditions than older FERC-regulated facilities, they score eight. Federally-owned facilities, not subject to FERC licensing, that have been subject to an environmental operations review since 1986 also score an eight because they tend to have better environmental conditions than other facilities. Others score "10" for water impacts in recognition of the potential for significant aquatic harm and "15" for land impacts to account for the adverse and permanent impacts caused by reservoir creation.

SCORE	OWNERSHIP OR CERTIFICATION
0	
4	Project meets criteria required for certification as Low Impact Hydropower (Using criteria in Attachment B)
8	Project is non-federally owned with FERC Relicense since 1986 but does not qualify as low impact hydro OR is federally-owned and has had an environmental operations review since 1986
10 (water); 15 (land)	others

Where federal or state government resource management agencies have recommended that a hydro facility be removed because of its severe ecological or dam safety impacts, the plant will be scored "20".

The score derived from this set of questions produces both water quality and land quality scores for all hydro

[27] The Low Impact Hydropower is assigned a score of "4" for the four land and water issue criteria to reflect satisfactory impact protection and mitigation. A lower score would require lower impacts, levels that may be achieved by small in-stream hydro facilities with no impoundments, and negligible impacts on native fish populations. The scoring framework set forth here does not produce a score lower than four.

[28] These criteria were developed by the non-profit organization American Rivers, Inc. and the service provider Green Mountain.com.

facilities. (The air quality score is derived in the same manner as for other technologies -- generally a zero for each of the four air criteria.) The total score for a hydro facility is developed in the same fashion as the total score for any generating technology -- by averaging the air, water and land scores. (See Scoring Environmental Impacts discussion, above.)

V. Adjustments for Purchases of New Renewable and Environmentally Preferred Energy Resources

Power Scorecard provides a strong inducement for service providers to invest in new, low-impact, naturally reoccurring renewable and environmentally preferred energy facilities by showing a second rating for each product based on the size of such commitments. (See Product Scoring section, below.)

Qualifying new capacity (as determined per the definition adopted by the Center for Resource Solutions' Green-e standard in a particular state/region[29]) will be counted from the time it is officially contracted, as long as the capacity is scheduled for operation within 12 months of the contract. In the case of repowered capacity, only the net increase in kilowatt-hours will be awarded this bonus. Verification that the resource has come on-line in accordance with the schedule is required.

To qualify, the resource must be scored at the facility rather than by default, and will not qualify if it scores greater than 5 for any two of the eight rating criteria or receives penalty points (e.g., geothermal plants adversely affecting ground or surface water quality). Examples of renewable energy sources include solar, wind, geothermal, and biomass. Landfill gas fueled facilities may qualify as a low-impact environmentally preferred resource. New hydropower facilities do not qualify as preferred new capacity.

VI. Data Collection

Rating the environmental quality of electricity services depends on obtaining accurate information on the environmental characteristics of the electricity supplies that service providers generate or purchase to serve their customers. It invites service provider cooperation and an opportunity to provide sufficient detail to support claims of environmental quality. Electricity supplier responses to *Power* Scorecard data collection questions are designed to be verifiable, usually by reference to statewide databases, to ensure accuracy. Data collected will be subject to annual audit for verification purposes.

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[29] We will aim to keep the qualifying in-service date aligned with the in-service dated used by Green-e to define new capacity. The in-service date requirement may vary in states where public policy has established another date for defining what constitutes new capacity. The Power Scorecard will treat qualifying new capacity as new for ten years, assuring investors of favorable treatment for this period.

VII. Product Scoring

There are two ways to score electricity sources: 1) by assessing the actual performance qualities of the plants providing electricity, or 2) by assigning default scores associated with known technology characteristics of plants providing power. For any technology, the best scores may be obtained only by providing evidence of the low impact qualities of the specific electricity sources. The default scores assume that the technologies perform poorly. Attachment A provides the example default scores.

Calculating a weighted average of the eight impact scores produces the final facility specific score. The weighted average assigns a double weight to the Global Climate Change measure and single weights to the other seven, for reasons explained above.

The overall Product Score is the weighted average of the scores for the electricity supply resources that comprise the product, weighted for the share each source contributes to the total product. Products which have been on the market for one year or more and which will continue to be offered without significant change will be rated on the mix of resources delivered to a customer's "market area bulk power grid" over the past year (i.e., most recent twelve months for which data is available). All other products will be rated based on the mix of resources expected to be delivered to a customer's "market area bulk power grid" over the appropriate month period.[30] Products delivered either as actual supply (trackable deliveries) or as deliveries on a customer's behalf are scored in the same manner.[31]

System power purchases from wholesalers with unspecified supply arrangements and pool net interchange or other undifferentiated market purchases are assigned power scores based on pool-wide system averages, unless the wholesale supplier's mix has been rated. When the past year's pool residual average is available, it can be used.

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[30] Although *Power* Scorecard scores products based on representations of delivery of specified resources within the year, it does not evaluate the basis, or lack thereof, for these representations. State Attorneys General disclosure rules and marketing guidelines will be used to designate those resources that can be included in prospective product descriptions.

[31] Deliveries on a customer's behalf include deliveries of electricity into the same bulk power grid from which the customer takes delivery but which are not intended to be tracked as delivered to the customer. For example, a producer may sell a block of renewable or other "premium" power at a price above the cost of the power actually delivered to the customer. The customer's premium underwrites the operation of existing renewables selling power into the bulk power grid and may also underwrite the development of additional renewable resources to sell into the grid in the future.

It is important, in states that may require some form of environmental disclosure,[32] to distinguish *Power* Scorecard product scores from environmental product labels. A product's *Power* Scorecard score and its disclosure label may not be based on the same combination of facilities or the same time frame (i.e., the settlement period).

Six scoring categories have been identified to assist customers in understanding *Power* Scorecard scores: **excellent, very good, good, fair, poor and unacceptable**. The category designation for any product depends on the *Power* Scorecard score of the resources.

The scores required for placement in the categories are:

Rating	*Required score*
Excellent	1.5 or less
Very Good	>1.5 to 2.5
Good	>2.5 to 3.9
Fair	>3.9. to 5.5
Poor	>5.5 to 7.0
Unacceptable	>7.0 - 10+

Power Scorecard treats existing and new facilities the same in the quantitative scoring of impacts, but it provides a separate and distinct set of category ratings to highlight those products that include a significant commitment to new renewable/environmentally preferred energy facilities. The categories are determined by the percentage of new renewables that comprise the product. For example, a product that contains 20% new renewables in the product mix would be assigned a category designation of "VERY GOOD".

The percentage of new renewables required for placement in the categories are:

Rating	*Required Score*
Excellent	=>25 % or more new renewables
Very Good	=>10% to <25% new renewables
Good	=> 5% to <10% new renewables
Fair	=> 2.5% to <5.0% new renewables
Poor	>0% to <2.5% new renewables
Unacceptable	no new renewables

[32] Illinois, Massachusetts, and New York have adopted, and other states are considering, rules requiring suppliers to disclose the fuel mix and emissions related to products. See *Consumer Disclosure. . .* the Regulatory Assistance Project, Nov. 1997.

ATTACHMENT A

Technology Based Default Scores

You may obtain a score for an electricity source by identifying the technology used at the plant to produce the electricity you are purchasing to serve your customers.

Generally a better score may be obtained by providing information on the actual characteristics of the plant using the Facility Scoring Sheet. These default scores for technology types are provided to allow scoring of products when relatively little environmental impact information is available, or (on a prospective basis) resources have not yet been procured.

These default scores represent high impact applications allowed by regulation or law. Many facilities may earn scores reflecting lower impact applications if they provide information demonstrating lower impacts. The default scores are used when other information is not available from the supplier or facility owner/managers. The Power Scorecard searches for representative information on plant design and operating characteristics, using default scores set forth below when other verifiable information is not available.

When little is known about the technology, the highest score among the options for that type will be awarded. For example, if the capacity is known to be oil fueled but nothing more is known, a score of 6.2, for oil fueled steam electric technology, will be selected.

Following the table are brief definitions of the technologies for which default scores are provided:

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ATTACHMENT A.

September 22, 2000

These default scores represent high impact applications allowed by regulation or law. The default scores are used when other information is not available from the service provider or facility managers. Lower impact scores will be assigned when information demonstrating lower impacts is provided.

TECHNOLOGY **(default for general fuel types in bold)**	Score	CO2	SOx	NOx	Mercury	Water Use	Water Quality	On-Site Land Use	Off-Site Land Use
Solar Distributed PV	0.0	0	0	0	0	0	0	0	0
Wind Turbine Plant; low land impact	0.1	0	0	0	0	0	0	1	0
Wind Turbine Plant: Poorly Sited	**1.1**	**0**	**0**	**0**	**0**	**0**	**0**	**10**	**0**
Geothermal; Binary Technology	1.4	0	0	0	0	1	6	3	1
Landfill Gas (IC Engine, high NOX rate)	1.6	0	1	7	1	1	0	3	1
Low Impact Hydro	1.8	0	0	0	0	4	4	4	4
Geothermal; Flash Technology	**2.0**	**1**	**1**	**1**	**0**	**2**	**6**	**3**	**3**
Biomass: Certified Sustainable Fuel, NOx Controls	2.1	0	1	5	1	1	6	2.5	2
Biomass: Certified Sustainable Fuel High NOx	2.2	0	1	6	1	1	6	2	2.5
Solar Central Station PV	**2.6**	**0**	**0**	**0**	**0**	**1**	**6**	**14**	**0**
Biomass: Some CC Benefit "clean supply", NOx Controls	3.0	2	1	5	1	1	6	5	4
Hydro Plant; Private, Post-1986 Relicense	3.6	0	0	0	0	8	8	8	8
Biomass: High NOx, Some CC Benefit, mixed supply	3.7	2	1	6	6	1	6	5	4
Natural Gas Combined Cycle (w/NOx controls)	3.9	5	1	5	1	4	6	3	5
Natural Gas Combined Cycle	4.0	5	1	6	1	4	6	3	5
Biomass: Wood Fueled, High NOx, Biomass not replaced	4.1	4	1	6	6	1	6	5	4
Gas Fired Steam Electric (w/SCR and SWI)	4.3	6	1	5	1	5	6	4	5
Gas Fired Steam Electric	**4.4**	**6**	**1**	**6**	**1**	**5**	**6**	**4**	**5**
Natural Gas Combustion Turbine	5.2	9	1	8	1	1	6	6	5
Biomass: Wood Fuel, High NOx, No CC Benefit, has waste	**5.4**	**10**	**1**	**6**	**6**	**1**	**6**	**5**	**4**
Hydro Plant; default	5.6	0	0	0	0	10	10	15	15
Oil-Fired Steam Electric (0.5% sulfur content)	5.9	8	3	7	4	6	6	4	7
Oil Fired Combustion Turbine	6.0	9	4	8	5	1	6	5	6
Oil-Fired Steam Electric (1.0% sulfur content)	6.1	8	4	7	4	6	6	4	7
Oil Fired Steam Electric	**6.2**	**8**	**6**	**7**	**4**	**6**	**6**	**4**	**7**
Coal With FGD (low mercury content)	8.1	10	4	10	6	9	6	5	13
Coal With FGD (high mercury content)	8.4	10	4	10	9	9	6	5	13
Coal Fired Steam Electric	**8.8**	**10**	**10**	**10**	**10**	**9**	**6**	**5**	**9**
Nuclear	**11.8**	**0**	**0**	**0**	**0**	**10**	**6**	**55**	**34**
Mass Burn Municipal Waste	**Under**	**Review**	**--**	**To**	**Be**	**Added**	**Soon**	**--**	**--**

Technology Types:

Coal-Fired Steam Electric:
Make this selection for coal-fired electric power. If evidence is available that the facility uses a low sulfur coal, please provide the supporting information and select the appropriate entry for low sulfur coal. If information is available that the facility utilizes a flue gas desulfurization system, make the appropriate selection below. The assumed heat rate is 10,500. The expected lifetime is 30 years.

Coal-Fired Steam Electric, with Flue Gas Desulfurization (high mercury content):
If information is available that the facility utilizes a flue gas desulfurization system, please select this category. If additional information exists regarding the mercury or sulfur content of the coal, please provide the supporting documents and select the appropriate category below. The assumed heat rate is 10,500. The expected lifetime is 30 years.

Coal-Fired Steam Electric, with Flue Gas Desulfurization (low mercury content):
Make this selection for coal, when information is available regarding the existence of a flue gas desulfurization system at the facility and supporting information about the mercury content and emissions rate of mercury. The assumed heat rate is 10,500. The expected lifetime is 30 years.

Biomass: Wood Fueled Stoker (Default):
Make this selection for Biomass-fired electric power supply. The default assumes no NOx control. It assumes a heat rate of 13,900 and a lifetime of 30 years.

Biomass: Wood Fueled Stoker (NO_X controls):
If supporting information is available regarding the utilization of NO_X controls at the biomass facility, please make this selection accompanied with data on the existence of NO_X controls. The assumed heat rate is 13,900. The expected lifetime is 30 years.

Biomass: Wood Fueled, Low Impact:
Make this selection for Biomass that utilizes a clean wood fuel supply and wood harvesting sources that subscribe to sustainable harvesting practices. Supporting information is required demonstrating the quality of the input fuel source and the protocol for wood harvesting. The low impact assumes use of cooling tower technology.

Mass Burn Municipal Waste:
Make this selection for any electric power purchases from a waste-to-energy facility or refuse derived fuel facility. The assumed heat rate is 16,373. The expected lifetime is 30 years.

Oil-Fired Steam Electric (default):
Make this selection for electric power purchases from an oil-fired, or gas/oil fired steam electric facility. If information is available on the utilization of a low sulfur content oil please choose the appropriate category

below. The assumed heat rate is 10,500. The expected lifetime is 30 years.

Oil-Fired Steam Electric (1.0% sulfur content) or *Oil-Fired Steam Electric (0.5% sulfur content):*
Make this selection for an oil-fired steam electric facility, or, oil/gas fired steam electric facility that is demonstrably burning a low-sulfur oil. The assumed heat rate is 10,500. The expected lifetime is 30 years. A facility not providing documentation on the use of a lower sulfur content oil will be given the Oil Fired Steam Electric default of 2.2% sulfur content.

Gas-Fired Steam Electric (default):
Make this selection for a gas-fired steam electric facility. If information is available regarding the existence of NO_X controls at the facility sup plying power, refer below to the lower NO_X gas-fired steam electric alternative. The assumed heat rate is 10,500. The expected lifetime is 30 years.

Gas-Fired Steam Electric with NOX Controls:
Make this selection for a gas-fired steam electric facility with NO_X controls. If information can be provided regarding the employment of selective catalytic reduction technology, select the appropriate alternative below. The assumed heat rate is 10,500. The expected lifetime is 30 years.

Gas-Fired Steam Electric (w/SCR and SWI):
Make this selection for a gas-fired steam electric facility with selective catalytic reduction and steam water injection control technology. The assumed heat rate is 10,500. The expected lifetime is 30 years.

Gas-Fired Combined Cycle Power Plant:
Make this selection as the default for a gas-fired combined cycle power plant. If information is available to establish the admissibility of a low NO_X (or higher heat rate) facility, please submit the supporting materials and select the alternatives *Gas-Fired Combined Cycle Power Plant (low NO_X facility).* The assumed heat rate is 9,224. The expected lifetime is 30 years.

Oil-Fired Combustion Turbine:
Use this option as the default for electricity supplied from an oil-fired combustion turbine
The assumed heat rate is 13,600. The assumed capacity factor is 10%.

Gas-Fired Combustion Turbine:
Use this option as the default for electricity supplied from a gas-fired combustion turbine. The assumed heat rate is 14,520. The assumed capacity factor is 10%.

Landfill Gas (default):
Select this alternative for electric power supplies from a landfill gas to energy project. This option assumes the utilization of an internal combustion engine (IC Engine, high NOx rate) with a relatively high NO_X rate. If evidence is available that the technology employed is a simple-cycle gas combustion turbine, or a boiler/steam turbine configuration, please select the appropriate alternative below. The assumed heat rate is 12,000

Btu’s/kWh.

Landfill Gas: Low Impact:
Select this alternative for electric power supplies from a landfill gas to energy project that has a demonstrably low NO_X emissions.. Supply information on the NO_X emissions rate of the facility.

Hydro-Electric Facility (default):
Use this alternative for hydro-electric power supplies, If information is available regarding the projects ownership (federal or private), its date of relicense, or more detail on the extensive mitigation efforts, please provide the supporting information and select the appropriate alternative below.

Hydro-Electric Facility (federally owned):
Use this alternative for hydro-electric power supplies that are owned by the federal government (not subject to regulation by the Federal Energy Regulatory Agency –FERC) and have been subject to a formal review of the environmental impact of its operations sometime after 1986.

Hydro-Electric Facility (FERC regulated, relicensed after 1986):
Make this selection for hydro-electric power supplies that are regulated by FERC and have been relicensed after 1986.

Hydro-Electric Facility (certified low-impact by the Low Impact Hydropower Institute program):
Use this alternative for hydro-electric power supplies that have obtained certification as a *low-impact hydro facility* by the Low Impact Hydropower Institute. See Attachment B for information about this certification program.

Geothermal; Flash Technology (default):
Select this alternative for all electric power supply from geothermal power. If documentation is available that the geothermal supply is from an alternative technology type (Binary technology or low-impact geothermal flash technologies) please provide the documentation and select the appropriate technology alternative.

Geothermal; Binary Technology:
Make this selection for geothermal facilities using Binary technology

Geothermal; Low Impact:
Make this selection only if providing documentation regarding the land use, water use and water quality characteristics of the facility and mitigation measures in place to reduce land and water use impacts.

Wind Turbine Plant (default):
For electric power supply from a wind turbine facility select this option. The default characterization is a poorly sited wind turbine plant. If data is available to establish the admissibility of a low land impact facility, please submit the supporting materials and select the alternative *Wind Turbine Plant (low land impact)*

Wind Turbine Plant (low land impact):
If data is available to establish the admissibility of a low land impact facility, please submit the supporting materials and select the low land impact score.

Solar Central Station PV (default):
Use this selection as the default for central station PV. If detailed information is available that justifies the admissibility of mitigated land impacts, please submit the documentation and select the Solar Central Station PV (low land impact) alternative below.

Solar Distributed PV:
Select this option for distributed PV utilizing such existing structures as rooftop PV, parking garage integrated PV and other dual-use structures demonstrably eliminating the need for dedicated land use.

Nuclear Fuel Steam Electric:
Make this selection for nuclear fueled steam-electric power. If the facility uses a closed cycle cooling system, provide supporting information. If information is available on the total site land use (acres per MW), report that with supporting documentation. The expected lifetime of the default facility is 30 years.

ATTACHMENT C

CRITERIA FOR LOW IMPACT HYDRO FACILITIES

The following summarizes the Low Impact Hydro Certification Program administered by the Low Impact Hydropower Institute ("LIHI"). For more information on this program contact the LIHI at telephone: (415) 561-2100

LOW IMPACT HYDROPOWER CERTIFICATION PROGRAM

INTRODUCTION

< November 8, 1999 >

The Low Impact Hydropower Institute ("Institute") has established a Low Impact Hydropower Certification Program ("Certification Program") to certify hydropower facilities with impacts that are low compared to other hydropower facilities based on objective environmental criteria. The Certification Program's goals are to reduce the environmental impacts of hydropower generation, and to create a credible and accepted standard for consumers to use in evaluating hydropower. For a hydropower facility to be certified as low impact, objective certification criteria must be met in the following eight areas: (1) river flows, (2) water quality, (3) fish passage and protection, (4) watershed protection, (5) threatened and endangered species protection, (6) cultural resource protection, (7) recreation, and (8) facilities recommended for removal. A hydropower facility meeting the eight certification criteria will be certified as a Low Impact Hydropower facility, and will be able to use this certification when marketing power to consumers.

I. WHY CREATE A LOW IMPACT HYDROPOWER CERTIFICATION PROGRAM?

In the new world of consumer choice being created through electric power industry restructuring, environmentally preferable electric power is one of the markets developing first. From early evidence in California and Pennsylvania, energy from wind, solar, geothermal, biomass and hydropower are attractive to many consumers. But consumers often have questions about the specifics of various generation sources, including hydropower. What generation is environmentally preferable and what is not?

For many knowledgeable consumers, hydropower raises issues. They understand that hydropower dams have both positive and negative environmental impacts. Hydropower dams provide public benefits such as flood control, recreation, water supply, irrigation and the offset of fossil fuel and other power sources that generate air pollution. But hydropower dams also have environmental impacts, such as flooding river habitat, blocking fish passage, altering natural flow cycles, and degrading water quality. If a dam is well sited and well operated, these environmental impacts can be reduced, though not eliminated. Consumers are seeking a credible means to determine which hydropower facilities are well sited and well operated and thus provide the benefits of the hydropower while minimizing the dam's environmental impacts.

In states where the issue of distinguishing hydropower's benefits and impacts has been addressed legislatively, an interim solution used (based on PURPA's Qualifying Facility definition) is size. Small hydropower (less than an arbitrary cutoff, usually 30 megawatts) is defined as renewable. But this size criterion is a poor indicator of the environmental impacts of a hydropower facility. For example, small facilities that de-water river reaches and block fish passage may be more environmentally destructive than larger facilities designed and operated to reduce environmental impacts. Under this size criterion, a dam is either renewable or not – a small dam can be operated in a way that is harmful to the environment and still be environmentally preferable, and a large dam can undergo major changes to reduce the environmental impacts of its operation and still not be considered environmentally acceptable.

In addition, a small hydro criterion automatically certifies the majority of hydropower *dams* in the country, but eliminates from consideration the majority of the country's hydropower *capacity.* Of the over 2,000 hydropower dams in the US owned by entities other than the federal government, approximately 89% of the *dams* are "small" (less than 30 megawatts capacity), but together they only provide only 8% of the hydropower *capacity*. The remaining 11% of the dams produce 92% of the hydropower capacity. Thus, under the small hydro approach, we are classifying as environmentally preferable a large number of dams but not a large amount of power, and we are granting that preferred status without any examination of the operation of those dams.

To respond to the need for an impact-based evaluation of hydropower dams, the Low Impact Hydropower Institute has been established to create a voluntary program to certify hydropower facilities with environmental impacts that are low compared to other hydropower facilities based on objective environmental criteria. This distinction allows well sited and well operated hydropower dams to gain a market advantage for the benefits that hydropower dams provide.

The Institute's Certification Program evaluates the siting and operation of hydropower dams based on objective environmental criteria. The Institute has identified eight key areas that provide a reasonable approximation of the environmental impacts of a facility. The Certification Program establishes basic objective criteria for each of these eight areas. Because every dam and every river is different, it is not possible for objective standards to delineate with 100% accuracy all low impact hydropower facilities. However, the Low Impact Hydropower criteria are a good means of identifying those facilities whose siting and operation minimize the dam's environmental impacts.

II. PROGRAM GOALS AND OBJECTIVES

A. Program Goals:

The Low Impact Hydropower Institute's Certification Program has two equally important fundamental goals: (1) Reducing the environmental impacts of hydropower generation; by (2) Creating a credible and accepted standard for consumers to use in evaluating hydropower.

1. Reduce the environmental impacts of hydropower generation: ***A goal of the Low Impact Hydropower Certification Program is to improve existing conditions of natural resources affected by dams. The Low Impact Hydropower Certification Program will recognize facilities that are sited and operated in a manner that reduces environmental impacts, and will provide an incentive to other dam owners to change their operations to reduce environmental impacts. Certified facilities will at a minimum comply with applicable laws for protection of fish, wildlife, water quality, endangered species and cultural and recreational resources. In addition, because these are environmental criteria, the level of environmental protection will generally exceed current legal requirements, which often take more than environmental concerns into account.***

2. Create a credible and accepted standard for consumers to use in evaluating hydropower: ***A goal of the Low Impact Hydropower Certification Program is to create a credible and accepted standard for consumers to use in evaluating hydropower. The Certification Program will provide an independent and credible evaluation of hydropower to create a product that is effectively differentiated in the consumer marketplace for power. The Certification Program must be credible with consumers, the environmental community and the hydropower industry. To accomplish this, the Certification Program will be: (1) Based on objective certification criteria with a scientific basis; (2) Administered in a fair and efficient manner; and (3) Judged on applications that are open to public review and comment.***

B. Program Objectives:

To meet the two Program goals described above, the Institute's objective is to require hydropower certified facilities to meet eight criteria related to: (1) River flows, (2) Water quality, (3) Fish passage and protection, (4) Watershed protection, (5) Threatened and endangered species protection, (6) Cultural resource protection, (7) Recreation, and (8) Facilities recommended for removal. The certification criteria have been designed with the recognition that if the level of environmental protection is set too high, an insufficient amount of power would be eligible for certification and thus the value of the program in the emerging power market would be undermined. If an effective market for low impact hydropower develops, the level of environmental protection in the criteria is intended to increase over time, consistent with the Institute's recognition of the need for a robust environmentally preferable power market.

III. CERTIFICATION CRITERIA:

The eight Low Impact Hydropower certification criteria are described below. The approach taken for setting the criteria is designed to establish objective criteria while recognizing that conditions at every dam and on every river are different. The criteria rely on formal recommendations of expert government agencies whose mandates are to protect the resources the criteria are designed to evaluate. Thus, for most criteria the hydropower facility must meet the latest and most stringent recommendation of the relevant state or federal resource agencies. To accommodate situations where appropriate resource agency recommendations do not exist, the criteria establish other objective criteria to meet the same goals. If a facility meets the requirements under all eight of the criteria, the facility will be certified as Low Impact Hydropower. A facility failing on one or more of the criteria will not be certified. The criteria do not apply to new hydropower facilities, hydropower facilities outside of the United States, and pumped storage facilities. For the specific criteria requirements, see the Low Impact Hydropower criteria in Part VI below.

1. Flows: The Flows Criterion is designed to ensure that the river has healthy flows for fish, wildlife and water quality, including seasonal flow fluctuations where appropriate. For instream flows, a certified facility must comply with recent resource agency recommendations for flows, or meet one of two alternative standards to demonstrate that flows are appropriately protective of water quality, fish and wildlife.

2. Water Quality: The Water Quality Criterion is designed to ensure that water quality in the river is protected. The Water Quality Criterion has two parts. First, an Applicant must demonstrate that the facility is in compliance with state water quality standards, either through producing a recent Clean Water Act Section 401 certification or providing other demonstration of compliance. Second, an applicant must demonstrate that the facility has not contributed to a state finding that the river has impaired water quality under Clean Water Act Section 303(d). Subject to approval by the Governing Board, beginning in 2002, an Applicant will also have to demonstrate that the facility has a program for monitoring water quality.

3. Fish Passage and Protection: The Fish Passage and Protection Criterion is designed to ensure that, where necessary, the facility provides effective fish passage for riverine, anadromous and catadromous fish, and protects fish from entrainment. For riverine, anadromous and catadromous fish, a certified facility must be in compliance with both recent mandatory prescriptions regarding fish passage and recent resource agency recommendations regarding fish protection. If anadromous or catadromous fish historically passed through the facility area but are no longer present, the facility will pass this criterion if the Applicant can show both that the fish are not extirpated or extinct in the area due in part to the facility and that the facility has made a legally binding commitment to provide any future fish passage recommended by a resource agency. When no recent fish passage prescription exists for anadromous and catadromous fish, the Applicant must demonstrate either that there was a recent decision that fish passage is not necessary for a valid environmental reason, or that existing fish passage survival rates at the facility are greater than 95% over 80% of the run.

4. Watershed Protection: The Watershed Protection criterion is designed to ensure that sufficient action has been taken to protect, mitigate and enhance environmental conditions in the watershed. A certified facility must be in compliance with resource agency and Federal Energy Regulatory Commission ("FERC")

recommendations regarding watershed protection, mitigation or enhancement. Subject to approval by the Governing Board, beginning in 2002, an Applicant must demonstrate that the facility has sufficiently protected, mitigated or enhanced environmental conditions in the watershed through meeting one of four requirements for watershed protection, all of which involve either protecting, mitigating or enhancing watershed land or spending or dedicating funds for conservation purposes.

<u>5. Threatened and Endangered Species Protection:</u> The Threatened and Endangered Species Protection Criterion is designed to ensure that the facility does not negatively impact state or federal threatened or endangered species. For threatened and endangered species present in the facility area, the Applicant must either demonstrate that the facility does not negatively affect the species, or demonstrate compliance with the species recovery plan and receive long term authority for a “take” (damage) of the species under federal or state laws.

<u>6. Cultural Resource Protection:</u> The Cultural Resource Protection Criterion is designed to ensure that the facility does not inappropriately impact cultural resources. Cultural resources must be protected either through compliance with FERC license provisions, or through development of a plan approved by the relevant state or federal agency.

<u>7. Recreation:</u> The Recreation Criterion is designed to ensure that the facility provides access to the water and accommodates recreational activities on the public’s river. A certified facility must be in compliance with terms of its FERC license or exemption related to recreational access, accommodation and facilities. If not FERC-regulated, a certified facility must be in compliance with similar requirements as recommended by resource agencies. A certified facility must also provide access to water without fee or charge.

<u>8. Facilities Recommended for Removal:</u> The Facilities Recommended for Removal Criterion is designed to ensure that a facility is not certified if a natural resource agency concludes it should be removed. If a resource agency has recommended removal of a dam associated with the facility, certification is not allowed.

IV. CERTIFICATION PROCESS

Certification under the low Impact Hydropower Program is designed to be a fair and efficient process for determining whether a hydropower facility has low environmental impacts. An Applicant fills out a certification questionnaire, attaches supporting information and forwards the completed application to the Low Impact Hydropower Institute. Early emphasis of the Certification Program will be on facilities in New England and the Pacific Northwest, although applications will be accepted for certification of facilities in other regions. The Certification Administrator posts the complete application on the Institute’s Web page for a 60-day public comment period, and forwards the full application package (with any public comments) to the Application Reviewer. The Application Reviewer reviews the package, conducts any factual investigation needed to resolve factual disputes and evaluate the veracity of claims, and returns the application to the Certification Administrator with a certification recommendation. The Institute’s Governing Board makes a preliminary certification decision, which is posted on the Institute’s Web page for 30 days. If no appeal is requested by either the Applicant, or by any member of the public who commented on the application package, the decision becomes final. Any appeals are referred to the Institute's Appeals Panel for review. Certification decisions from the Appeals Panel are referred to the Governing Board, which approves the Appeals Panel's certification decision. A summary of the structure of the Low Impact Hydropower Institute is found in Part II, and the certification procedures are in Part III.

V. MARKETING

In order to protect the consumer and provide the greatest degree of credibility for the Low Impact Hydropower Certification Program, all marketing claims associated with Low Impact Hydropower certification must meet the requirements established for the Certification Program. These requirements can be found in Part V.

VI. LIMITATIONS OF THE LOW IMPACT HYDROPOWER CERTIFICATION PROGRAM

The Low Impact Hydropower criteria have been established as relatively simple objective criteria for distinguishing hydropower in the marketplace. These criteria should not, however, be considered a benchmark for exemplary environmental operations at hydropower facilities. While the criteria are intended to be a national base for evaluating impacts of hydropower, not all environmental impacts associated with hydropower facilities are addressed by the criteria. In addition, while the reliance on resource agency recommendations is designed to create an objective system based on scientific evidence that takes into account site-specific conditions, any specific facility may have unique conditions that require more or less stringent conditions for environmental protection. Thus, supporters of the Low Impact Hydropower criteria, officers and staff of the Low Impact Hydropower Institute and recipients of Low Impact Hydropower certification reserve the right to seek conditions other than those outlined in the Low Impact Hydropower criteria in any legal or administrative proceeding.

Support of the Low Impact Hydropower Certification Program or of the Low Impact Hydropower criteria also does not imply endorsement of any facility certified pursuant to the Certification Program or any resulting power product. Supporters of the Low Impact Hydropower criteria, and officers and staff of the Low Impact Hydropower Institute, reserve the right to individually endorse or otherwise comment upon facilities receiving Low Impact Hydropower certification and resulting power products. In addition, support of the Low Impact Hydropower Certification Program or of the Low Impact Hydropower criteria does not imply endorsement of any level of power consumption. Supporters of the Low Impact Hydropower criteria, and officers and staff of the Low Impact Hydropower Institute, reserve the right to promote energy conservation as an alternative to power generation.

The term Low Impact Hydropower should not imply that a certified facility has no environmental impacts. Not all environmental impacts associated with hydropower facilities are addressed by the criteria. In addition, the certification of some facilities as Low Impact Hydropower does not mean and should not imply that the Low Impact Hydropower Institute or its supporters, officers or staff are labeling other hydropower facilities as high impact.

The Low Impact Hydropower Certification Program is also intended only to aid in differentiating the environmental performance among hydropower facilities. The Institute certifies facilities whose impacts are low compared to other hydropower facilities based on objective scientific environmental criteria. As discussed above, this certification is being provided in order to allow well cited and well operated hydropower facilities to gain market advantage because of the benefits that hydropower provides compared to some other power sources. However, the certification does not compare hydropower generation impacts to the impacts of other forms of power production because the impacts of hydropower are not strictly comparable, in the Institute's view, to the impacts of other generation sources.

The Low Impact Hydropower criteria and other Certification Program requirements are subject to change by the Institute's Governing Board. While no significant changes to the Certification Program requirements are anticipated before the scheduled phase-in of water quality monitoring and watershed protection requirements in 2002, the Governing Board reserves the right to modify the criteria and other Certification Program requirements as needed.

ATTACHMENT D

Criteria for Site Scoring Wind Projects

The Power Scorecard uses seven criteria to broadly categorize the environmental impacts of wind plants on their surroundings and score their land impacts. Scores are assigned by using the following scale:

LAND IMPACT SCORE FOR WIND TECHNOLOGIES	CRITERIA
1	wind facility mostly suitable on seven siting criteria OR wind facility developed and fully compliant with applicable state- or region-wide windpower development guidelines developed through collaborative, multi-stakeholder process and acknowledged as suitable by state environmental siting officials;
3	wind facility mostly or moderately suitable on seven siting criteria OR site developed pursuant to and fully compliant with a collaborative, multi-stakeholder settlement process;
5	wind facility mostly suitable in five or more categories, not least suitable in any;
7	wind facility mostly suitable or moderately suitable criteria in three or more categories; not least suitable in any
10	wind not scored above.

The following describes the criteria by which a facility can be identified as suitable, moderately suitable, less suitable or least suitable.

SPECIFIC SITING CRITERIA[33]

These criteria have been developed with the assistance of wind industry stakeholders associated with the National Wind Coordinating Committee and members of the Appalachian Mountain Club ("AMC"). They are intended to be applicable in all geographic regions: the mountainous Northeast, the coasts, the Plains and the foothills, valleys and mountains of the West. The criteria, therefore are very general.

These seven criteria broadly describe the environmental impacts a wind generating facility has on its landscape. Criteria are scored from most suitable to least suitable by measuring the degree of change imposed by the wind facility. Wind facilities in non-pristine areas that are imposing changes not significantly different from those that have already occurred in surrounding areas are generally scored as suitable (e.g. a wind site in an area where communication towers are common features or where roads and structures already exist).

LAND USE

Wind plants should be located consistent with existing land use regulations (such as state or local zoning) and adjacent land uses. Contiguous or adjacent land use that emphasizes wilderness values and or areas dedicated to the protection of wildlife, particularly birds, may not be compatible with wind plants.

Where land use plans or regulations are not in place, development should be restricted to areas that have seen such activity in the past or are likely to in the future. For example, high elevation areas where future timber harvesting is unlikely ("non-commercial timberland") may not be suitable for wind power development. Areas identified by a state or federal entity for future public acquisition as conservation land may also be unsuitable.

Where land use regulations permit wind facilities but adjacent areas may be adversely impacted -- areas such as those dedicated to preservation of open space, growth management or non-wilderness recreation facilities, for instance -- the wind facility should be designed with particular mitigation techniques in place to enhance compatibility. Appropriate mitigation techniques are site specific.

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[33] Adapted from Appalachian Mountain Club General Policy on Windpower, Revised draft, as approved by AMC Conservation Programs Committee 6/13/96.

Most suitable: Site completely compatible with surrounding use and existing infrastructure.

Moderately suitable: Site with appropriate mitigation compatible with surrounding uses; mitigation developed by consensus of affected stakeholders (most of the affected stakeholders were satisfied with chosen mitigation techniques).

Less suitable: Wind facility imposes substantial changes in contrast with surrounding area; stakeholder interests taken into account but consensus on necessary mitigation not achieved.

Least suitable : Site incompatible with surrounding use, imposing stark change with no mitigation of impacts.

SOILS AND TOPOGRAPHY

Locating wind plants in areas unsuitable from a soils perspective can cause erosion, fine-body particulate matter in the air, water run off and sedimentation of local water supplies. Appropriate erosion and sediment control measures are crucial; the choice of techniques for controlling erosion and sedimentation is very site specific.

Most Suitable: Sites imposing minimum impacts on existing terrain and utilizing existing waterways, where vegetation has been retained (or desert pavements protected) and all sediment remains on site.

Moderately suitable: Sites which impact existing terrain to some degree but where proper, permanent slope stabilization and other techniques are used to control erosion and keep to low levels the potential for sedimentation of streams and ponds.

Less suitable : Sites requiring major terrain alteration (e.g. in mountainous areas those sites on steeper slopes requiring significant terrain alteration for access roads and turbine strings).

Least suitable: Sites requiring extensive terrain alteration where mitigation has not prevented erosion or sedimentation of waterways.

ROADS AND ACCESS

Commercial windpower facilities of greater than 1 mw will generally be located in more remote areas, where increased access may compromise the remote character of the site. In addition, high-elevation areas may be the least accessible parts of an otherwise accessible landscape. Evaluation of sites for access should follow the following hierarchy:

Most suitable: Site utilizes existing permanent and secondary access, including roads into and through the proposed site or roadless design.

Moderately suitable: Areas with well developed permanent and secondary access in the vicinity of the site where the number and width of new access roads is limited or most traffic restricted to existing roads. Problems with erosion that are likely due to historical road conditions have been adequately mitigated.

Less suitable: Areas with limited existing access in the vicinity of the site (i.e., few permanent roads or very low road density even in adjacent low- elevation areas)

Least suitable: Areas in which construction of the facility would have a significant impact on large areas that are essentially roadless.

VEGETATION AND NATURAL COMMUNITIES

Vegetation and natural communities CAN BE adversely impacted by wind facilities through direct loss and by the introduction of invasive, noxious and non-native plant species that thrive in areas disturbed by roads and other site construction. The significance of vegetation loss usually depends on the size of the area disturbed, and layout of access roads. Site plans should include habitat management plans to avoid the habitat of plants designated as protected, unique or rare.

Most suitable: Vegetation disturbance limited to insignificant portion of project site an mitigated in accordance with best available practices. No areas of significant vegetation, protected, rare or unique plant life negatively impacted on site. (In the northeast, completely spruce-fir forests at very high elevations are quite sensitive to perturbations and should be avoided.)

Moderately suitable: Project located so as to avoid disrupting areas of significant vegetation such as wetlands and protected plant communities.

Less suitable : Habitat which is uncommon or dwindling (such as mature second-growth spruce-fir forests across the northern New England) impacted at the site in a greater than incidental level.

Least suitable : Site was a pristine area, or an area of significant vegetation (wetlands or mature wooded areas where no evidence of previous harvesting is present) which would be destroyed or significantly disturbed. In the Northeast, Krummholz alpine areas ARE unsuitable for development..

WILDLIFE

Wildlife may be impacted by wind power projects directly or through loss of habitat, which sometimes reduces living space, food (prey and other), and predators. The type of wildlife potentially impacted varies from site to site and the potential to negatively impact birds and other aerial species must be considered. Suitably sited wind facilities will avoid areas that pose serious risk to these species, including areas where there are major migration concentrations (in flight and stopover), colonial or rare species (endangered, threatened, or watch listed) nesting sites, and major winter concentrations. Attention must be paid to which species are known to be susceptible to colliding with wind turbines.

Most suitable: Areas away from major winter concentrations for wintering and migrating birds (especially raptors), as well as nesting areas for colonial or rare species. Areas where local habitat has already been altered or disturbed by past activity and areas where habitat restoration is easily accomplished.

Moderately suitable: Areas away from major winter concentrations for wintering and migrating birds (especially raptors), as well as nesting areas for colonial or rare species, but containing known small-scale habitats for species of concern (such as certain mammals or birds); construction must be able to be located so as to avoid disrupting these sites.

Less suitable : Areas along major bird migration routes or with large presence of prey likely to attract raptors where mitigation has successfully reduced (although not eliminated) significance of impacts. (Note: information on the extent and location of migratory routes is generally lacking but the potential for large impacts should render a site "unsuitable," relegating it to the less suitable or least suitable classifications.)

Least suitable : Areas containing extensive or critical habitat for species of concern, whether this habitat is known to be used or only potentially available, such that construction could not avoid impacting these sites or the species that utilize them.

SCENIC

Assessing visual impacts requires a comparison of the setting and surrounding features with simulations of the completed project. The likelihood that surrounding areas will, in the future, be dedicated to uses which exclude human activity or to be designated as protected scenic vistas should be evaluated accordingly. Projects which significantly alter the project setting, deviate substantially from the form, line, color and texture of surrounding elements of the viewshed, substantially degrade the visual quality of the existing viewshed or block views of valuable visual resources should be scored as less or least suitable.

Most suitable: Areas where evidence of permanent human development is already a noticeable component of the landscape or local constituents and others did not identify region as scenically significant (e.g., highly developed recreational areas such as ski areas, working farms, and coastal industrial sites).

Moderately suitable: Project's primary scenic impact is to a viewshed which includes already developed areas (roads, settlements); areas of current or potential public recreation which depend on a natural landscape for their appeal are beyond the mid-ground (approximately 5 miles depending on topography) or project within mid-ground but not imposing. significant or offensive degree of change.

Less suitable : Surrounding area mostly natural in character, less dominated by evidence of human activity; project imposes substantial degree of change from surroundings. Less intensively used public recreation areas which depend significantly on natural landscape for their appeal are within the mid-ground (approximately 2-5 miles).

Least suitable : Project located within the fore- and mid- ground (approximately 0- 2 miles) of major public use areas (such as the Appalachian Trail, parks, high-value rivers and lakes, etc.) or within the mid-ground (approximately 2-5 miles) of less intensively used public recreation areas where degree of change imposed by project is significant and offensive.

RECREATION

Compatibility assessments should consider existing recreational areas that depend on a natural setting and those likely to support expanded recreational activities in the future.

Most suitable: Areas with little current use and no known plans for use in the future.

Moderately suitable: Areas where current use is limited to activities that co-exist well with managed forest landscapes (ex. Snow-mobiling, hunting) or where current back country use is low, and there is limited opportunity for increased back country recreation in the future.

Less suitable : Areas with moderate back country recreational use (such as hiking trails to minor peaks) where evidence of human activity is otherwise rare.

Least suitable : Areas not otherwise evidencing any human activity other than a high level of back country recreational use, or where the landscape features and location are such that the potential for increased back country use is high and human activity is negligible or absent.