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SUSTAINABILITY: A Central Principle for the Electric Utility Industry Available Through Vegetation Management on Transmission Rights-of-Way

SUSTAINABILITY:
A Central Principle for the Electric Industry Available Through Vegetation Management on Transmission Rights-of-Way

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Final Report, December 2009

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PRODUCT DESCRIPTION

Sustainability is a relatively new principle based on old ideals. Basic precepts of sustainability have guided human activity for as long as there has been society—making sure that what we do today does not negatively affect what people, particularly our children, can do in the future.

Over the last 20 years, much has happened that has elevated sustainability as an important consideration for industry and for society. Society's interest in sustainability is causing organizations to use the concept as a central guide to business. Some members of the electric utility industry are using the sustainability concept; most are not.

Sustainability relies on a set of technologies, management practices, and social and economic institutions that communities, governments, and industry use to ensure the long-term viability of their systems—in the case of this report, sustainability is equated with the electric utility industry and its effects on society through management of electric transmission line rights-of-way (ROWs). Simply put, actions are made to manage vegetation on ROWs in a sustainable way when they balance effort and effect on environment, society and economy. Electric utilities are encouraged to practice sustainability, particularly when they conduct integrated vegetation management (IVM).

This report does three things:

1) Defines sustainability and places it in a historical context using a brief literature review, including descriptions explaining why industry should use sustainable practices

2) Demonstrates that IVM is a ready-to-use model of sustainability that can be instituted by industry, if not already practiced—EPRI IVM performance standards are presented as a model of sustainability

3) Acknowledges that the electric industry generally does not fully accept the sustainability concept as a guide and goal for business, nor do they use vegetation management on electric transmission line rights-of-way as a hallmark of company efforts in sustainability

Results & Findings

EPRI performance standards for IVM were examined for their direct connection to sustainability principles. Each of the 42 criteria was readily fit into one of three categories of elements and considerations for sustainability: environmental, socio-economic, and administrative. This effort shows that a connection exists and that there is an opportunity for the industry to capture sustainability through application of IVM on transmission line rights-of-way.

An evaluation metric was developed to judge the degree of electric utility organization self-portrayal of efforts in sustainability and related efforts with vegetation management on transmission line rights-of-way. All 29 EPRI member companies in Program 57 had their websites fully evaluated using the evaluation metric to answer the following three questions: 1) Have the electric utilities embraced sustainability? 2) Is vegetation management portrayed in a light of sustainability? 3) Is vegetation management portrayed at all? The answer was "No" to all of these questions, with few exceptions (only three of 29 companies had "passing" grades, with only slight shortfalls in portrayal of sustainability and vegetation management).

Challenges & Objective(s)

This report is aimed at managers, regulators, and policy makers working on electricity transmission and vegetation management. Transmission organizations are the businesses most affected by this report, benefitting from increased understanding of sustainability and electric transmission line vegetation management, specifically IVM.

Applications, Values & Use

Interest in sustainability by electric utility stakeholders will continue to grow, and practitioners of vegetation management on electric transmission line rights-of-way should be aware of that interest and growth to better serve society.

EPRI Perspective

EPRI's rights-of-way research program supports research on IVM. Over the past several years, EPRI has been conducting IVM assessments using IVM performance standards. This work has revealed that most utilities are practicing IVM; however, they have not fully made the connection between IVM and sustainability. The report makes this connection, offering utilities opportunity to highlight sustainability as part of their vegetation management programs.

Approach

The project team's objectives were to raise awareness of sustainability as a business process and goal and to elevate the practice of IVM as an important corporate model of sustainability.

Keywords

Electric transmission line rights-of-way
Integrated vegetation management
Sustainable business
Conservation
Stewardship
Criteria and indicators
Electric utility websites

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John W. Goodrich-Mahoney and others critiqued an early version of this report when it was presented by C. Nowak as an oral paper at the 9th International Symposium, Environmental Concerns in Rights-of-Way Management, September 27-October 1, 2009, Portland, Oregon.

ACRONYMS

EPRI	Electric Power Research Institute
IVM	Integrated Vegetation Management
ROW	Right-of-Way (singular)
ROWs	Rights-of-Way (plural)

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1
INTRODUCTION

Sustainability is high in the conscience of society. This mindset revolves around a singular question and concern:

How can we maintain the long-term well-being of humans?

As human populations have increased across the globe over the past centuries, natural ecosystems have been degraded, with growing concerns for human well-being. Sustainability is seen as the way for achieving long-term human well-being by carefully caring for the environment and people, together.

The word sustainability is derived from the Latin *sustinere* (*tenere*, to hold; *sus*, up). Many definitions of sustainability have been developed, and most are associated with the words maintain, support and endure. Since the 1980s, sustainability has had broadened consideration. The 1987 Bruntland Commission of the United Nations is credited with providing the most recognized and accepted contemporary definition of sustainability: ***development that meets the needs of the present without compromising the ability of future generations to meet their own needs***. This simple definition is founded on several key principles that undergird sustainability (adapted from Burger 2000):

- Efficiency – resources should be managed such that a certain benefit is achieved with minimum input, or that a certain input delivers maximum benefit
- Social justice – benefits and drawbacks of resource use (profits and costs), as well as opportunities and risks, should be distributed fairly among the concerned social groups (stakeholders)
- Partnership – partnerships between key sectors of society and persons are called for across the elements of sustainability; without partnerships the changes necessary for sustainable business can neither be brought or maintained
- Consistency – calls for compatibility among sub-systems of management, and represents the hub of sustainable business, in that the ultimate aim of the vision of sustainability is to design the sub-system of human economic activity such that it becomes compatible in the long term with the overall system of the community, and ultimately our planet (see motto "Act locally, think globally)

Sustainability is a holistic concept that embraces all spheres of human life: environmental, social and economic. Balance amongst these elements is universally accepted as a basic way of considering sustainability and is represented by an illustration using three overlapping spheres, one for each element (Figure 1-1).

The history of development of the sustainability concept can be made long, with important developmental accomplishments just in the last two decades (Appendix A).

Today, many Fortune 500 companies have ascribed to the principles and elements of sustainability (e.g., Walmart and Home Depot, #1 and #22 in the listing of Fortune 500 companies (see SIDEBAR No. 1). Companies are working with and toward sustainability for two general, basic reasons:

1. Ethics and responsibilities – it is the right thing to do, to conduct business sustainably
2. Marketing and advertising – since many stakeholders are interested in sustainability, they are then likely to do business with those companies that are sustainable

Fields (2002), citing John Elkington in his article "Sustainable business makes dollars & sense", listed five reasons as to why corporations are embracing sustainability (adapted from Fields 2002; p. 144):

1. Social responsibility has become an important screen for many mutual funds, with companies that shun sustainability risk reducing demand for their stocks and therefore lowering stock prices
2. Companies are increasingly sensitive to public relations and the media more readily features stories on environmental irresponsibility
3. New environmental regulations, particularly in Europe – not only do these regulations affect behavior within companies operating nationally, they also spur multinational companies to meet the standards of their strictest markets rather than make an array of products to meet disparate standards
4. Peer pressure among top managers of different companies inspires one to meet the policies of others
5. Satisfaction of employees and other stakeholders (e.g., contractors, landowners) who are interested in the environment and society

Despite the enormous responsibility and opportunity with working on sustainability, it is apparent that the electric utility industry has not embraced the philosophy and associated principles and practices. There is both a need and opportunity for the industry to grasp and embrace sustainability.

Purposes of Report

In addition to introducing the concept of sustainability for an electric utility audience, this report has two main purposes:

1. define one key way of considering sustainability for the electric utility industry by connecting the EPRI Integrated Vegetation Management Performance standards to sustainability, and in the process show the industry that the use of IVM is tantamount to sustainability (see STUDY 1: SUSTAINABILITY AND ITS CONNECTION TO THE EPRI INTEGRATED VEGETATION MANAGEMENT PERFORMANCE STANDARDS); and

2. challenge the electric industry lack of awareness of sustainability by showing current shortfalls in commitment via an evaluation of corporate portrayal of sustainability and vegetation management on organizational websites (see STUDY 2: 3 EVALUATION OF THE ELECTRIC INDUSTRY'S COMMITMENT TO SUSTAINABILITY AND INTEGRATED VEGETATION MANAGEMENT).

   It is hoped that these two studies will stimulate thought and action by the electric utility industry on sustainability and the opportunities therewith by using Integrated Vegetation Management.

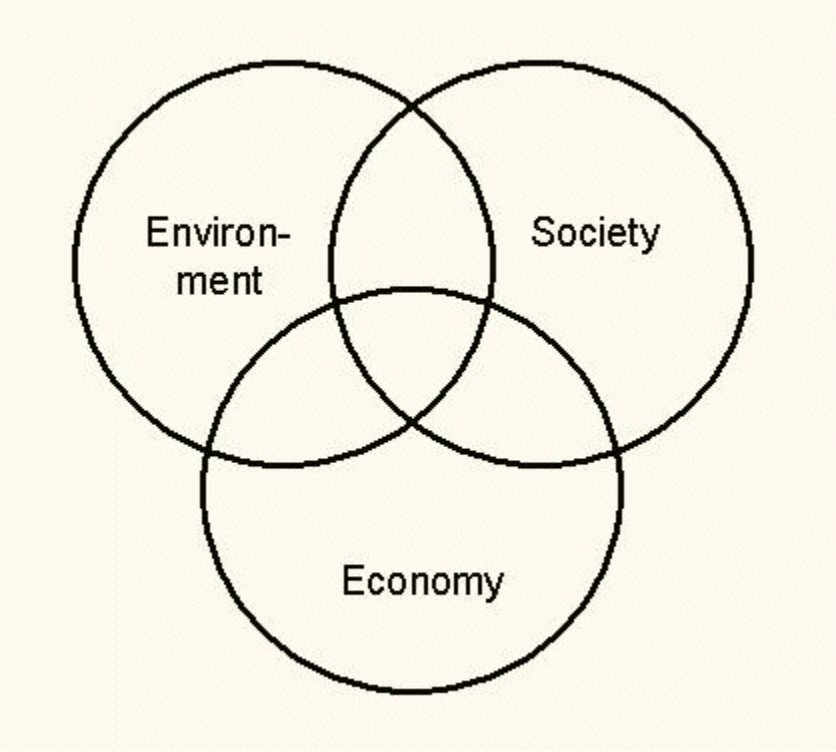

Figure 1-1
Simple, classic portrayal of sustainability as a three sphere diagram that represents core elements of sustainability – environment, society and economics. Sustainability is expected to occur in the area of overlap of all three spheres. The balance amongst the spheres—the elements of sustainability—is an outcome of stakeholder interest in the broad range of values that individuals and society seeks to emphasize: industry may emphasize profit, communities – jobs, landowners – aesthetics and recreation, conservation groups – non-market factors such as biodiversity and ecosystem function, and government regulators – the law. In a sustainable system, the mix of conditions, values and services are set by general agreement that puts the system in the overlap area of the three spheres.

SIDEBAR No. 1: Two Fortune 500 Companies Committed to Sustainability

Walmart

Walmart presents "sustainability as one of the most important opportunities for both the future of our business and the future of our world." Moreover, Wal-mart purports "Our opportunity is to become a better company by looking at every facet of our business—from the products we offer to the energy we use—through the lens of sustainability."

Recent evidence of Walmart's commitment to sustainability includes:

- a "Global Sustainability Report"
- "Sustainability 2.0 Video", which shows "how sustainability saves money and resources by using existing technology"
- Global Sustainability Milestone Meetings, including one held Thursday, November 12, 2009, in Bentonville, Arkansas, including a webcast and live Twitter updates

Website (accessed November 10, 2009): http://walmartstores.com/Sustainability/

Home Depot

The Home Depot features for sale sustainable forest products that are produced from resources such as wood harvested from responsibly managed forests, or contain a high percentage of recycled materials. Products include plywood, molding, doors, and dimensional lumber – such as Forest Stewardship Council (FSC) certified wood products that come from forests where environmental, social and economic interests and benefits are safeguarded. Home Depot includes this sale of certified wood as part of their overall effort to be sustainable and green under their broad "Eco-Options" program.

Website (accessed November 10, 2009): http://www6.homedepot.com/ecooptions/

2
STUDY 1: SUSTAINABILITY AND ITS CONNECTION TO THE EPRI INTEGRATED VEGETATION MANAGEMENT PERFORMANCE STANDARDS

Vegetation management on power line corridors has evolved over the past century. In the early and mid parts of the 20th century, vegetation on rights-of-way was regularly and routinely removed to create an open corridor for the safe and reliable transmission of electricity (Nowak et al. 1993; Jackson 1997). With the advent of herbicides in the 1940s/50s and attendant opportunities for selective removal and control of problem plants, coupled with the environmental movement in the 1960s and 1970s, a more in depth and encompassing approach to vegetation management was developed by academia and industry (Nowak and Abrahamson 1993). Over the past two decades, this evolving approach to vegetation management has been progressively connected to the discipline of Integrated Pest Management (McLoughlin 1997, 2002). Today, the evolution of vegetation management continues with the ongoing development of a pest management system specifically tuned to power line rights-of-way—Integrated Vegetation Management (IVM) (McLoughlin 1997, 2002; Nowak and Ballard 2005).

IVM has a focus on eliciting site-specific, ecosystem-sensitive, economically-sensible, and socially-responsible treatment effects that lead to refined prevention and control of target plant pests (Wagner 1994; Nowak and Ballard 2001; EPRI 2002; Nowak et al. 2002) – this means that IVM can be directly related to sustainability. An IVM model for rights-of-way that fully incorporates a sustainability focus, and frames it in a full system context has been developed for the electric utility (Nowak and Ballard 2001, 2005; EPRI 2002, 2004a,b), roadside (Nowak 2005) and gas pipeline (Nowak et al. 2002) industries. This IVM model was developed, in part, using key support from EPRI (EPRI 2004a,b). Over the past 5 years, EPRI has been using this model to develop and test IVM performance standards (Nowak et al. 2008). Today, the EPRI IVM performance standards (documented in Appendix B) define those key elements and processes needed to balance considerations for socioeconomics and the environment, as bonded by administrative policies and procedures.

Adapted from Nowak (2008) and Nowak et al. (2008)

Study Objective

Demonstrate how the 42 criteria in the EPRI IVM performance standards are connected to sustainability.

Methods

Each of the 42 criteria from the EPRI IVM Performance Standards (Appendix B) was grouped into one or more categories of sustainability elements: environmental, socio-economic and administrative. Any one criterion could be grouped into more than one of these categories.

Environmental criteria include elements of management related to environmental resources at wide ranges of scales of time and space, including environmental resources such as air, water, soil, flora, and fauna, and environmental processes such as nutrient cycling, water dynamics, energy flow, and reproduction and gene flow (Figure 2-1).

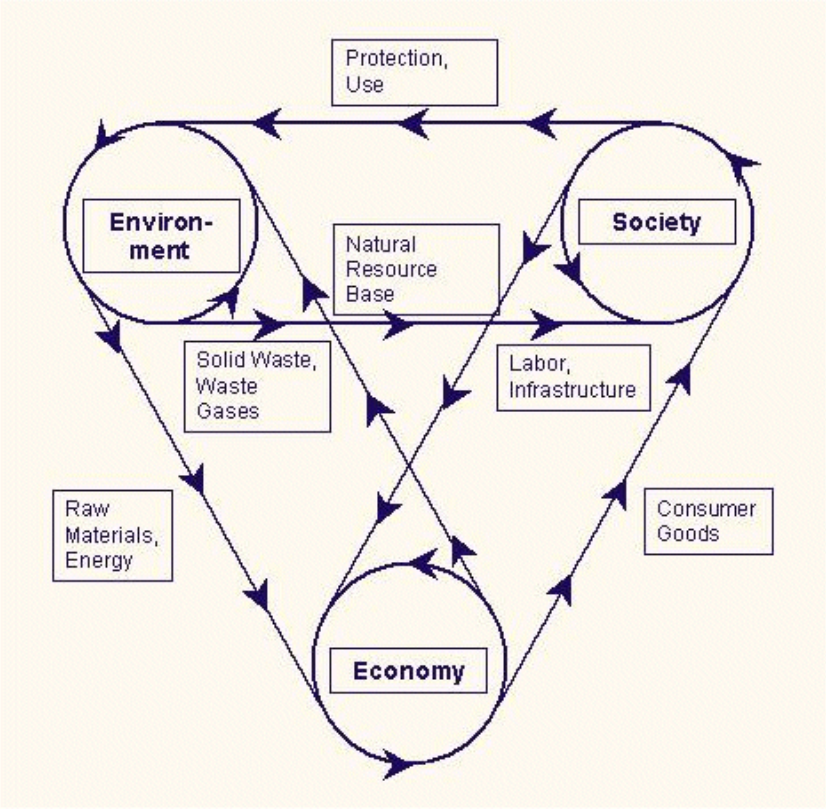

Figure 2-1
Flow of resources amongst the three, basic sustainability elements – environment, economy and society (adapted from Burger 2000). Sustainability is predicated on a balance integration of all three elements.

Social and economic (socio-economic) criteria capture considerations for human capital, including artificial capital (machinery, roads, and buildings), people with their education, training and health, and the established body of rules, institutions and collective knowledge that guide human activity (Figure 2-1).

Administrative criteria focus on policies, procedures and plans needed to implement the environmental and socio-economic elements of a sustainable management system. Administration in this report is more aligned with the methods needed to manage the affairs of a group of people, and not the people themselves (people as parts of a sustainable system are more directly included in socio-economic criteria).

This three category system of accounting for sustainability elements—environmental, socio-economic, and administrative—is new and was originally developed for this study. Most models of sustainability include environment, social and economic as the "three pillars (see Figure 2-1). Combining social and economic has been done in the past, but the formal recognition of the need for administrative elements as part of a sustainable system is novel (see Figure 2-2).

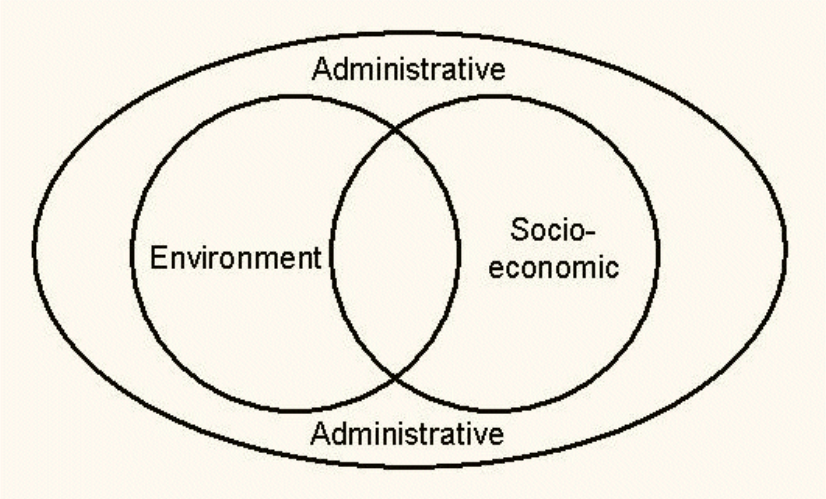

Figure 2-2
A new portrayal of sustainability elements for operations such as right-of-way vegetation management that consists of two basis elements – environment and socioeconomics, supported by administration.

Results and Interpretation

All criteria were readily grouped into one or more of the three sustainability elements. Environmental, socio-economic and administrative elements were represented by 12, 20 and 18 criteria, respectively (Table 2-1). These disparate totals for the three elements does not mean that socio-economic and administrative elements are more important than environmental. It is more a result of depth and complexity of select criteria. Some of the environmental criteria are high in depth and detail (e.g., see Criterion 8.1 in Appendix B), in contrast with some of the socio-economic and administrative criteria which are more simple and direct (e.g., see Criterion 1.2 in Appendix B).

In general, environmental criteria are gathered in Principle 6 (Accounting for Economic and Ecological Effects of Treatments), with the socio-economic and administrative criteria represented across the other nine principles (Table 2-1).

It is not surprising that the three elements of sustainability are well represented in the EPRI IVM Performance standards – they were originally constructed to have that breath and completeness of representation (see the introductory text to this Section 2) (Nowak et al. 2008). However, while this idea of using the sustainability elements to build the standards was an important underpinning, this is the first time that an explicit connection has been made between the EPRI IVM Performance Standards and sustainability elements.

Table 2-1
Connecting the EPRI IVM Standards with Sustainability Elements.

EPRI IVM Standards -- Principles and Criteria*	Sustainability Element
Principle 1: Compliance With Laws	
Criterion 1.1: abide by all laws and regulations	**Socio-economic**
Criterion 1.2: control of unauthorized use	**Socio-economic**
Criterion 1.2: demonstrated long-term commitment to IVM	**Administrative**
Principle 2: Tenure and Use Rights and Responsibilities	
Criterion 2.1: easements and other, formal defined use rights	**Socio-economic**
Criterion 2.2: dispute resolution with external stakeholders	**Socio-economic**
Principle 3: Community Relations and Workers' Rights	
Criterion 3.1: rights of workers to organize and negotiate	**Socio-economic**
Criterion 3.2: workers as civic participants via service	**Socio-economic**
Criterion 3.3: health and safety of employees	**Socio-economic**
Criterion 3.4: worker grievance resolution	**Socio-economic**
Criterion 3.5: fair wage levels and other worker compensation	**Socio-economic**

Table 2-1 (continued)
Connecting the EPRI IVM Standards with Sustainability Elements.

EPRI IVM Standards -- Principles and Criteria*	Sustainability Element
Principle 4: Management Planning	
Criterion 4.1: strategic management plan	**Administrative**
Criterion 4.2: tactical management plan	**Administrative**
Criterion 4.3: periodic revision of management plans	**Administrative**
Criterion 4.4: public summary of planned management activities	**Socio-economic**
Criterion 4.5: skilled and knowledgeable workforce	**Socio-economic**
Criterion 4.6: organizational infrastructure needed for management	**Administrative**
Criterion 4.7: annual public summary of management plans	**Socio-economic**
Principle 5: Understanding Pest and Ecosystem Dynamics	
Criterion 5.1: biological/ecological knowledge of ROW systems	**Environmental / Socio- economic**
Criterion 5.2: research and development	**All**
Criterion 5.3: worker training	**Socio-economic**
Principle 6: Setting Management Objectives and Tolerance Levels	
Criterion 6.1: setting management objectives, including social	**All**
Criterion 6.2: use of tolerance levels	**Administrative**
Criterion 6.3: stakeholder consultations	**Socio-economic**
Criterion 6.4: regular modification of plans using 6.1-6.3	**Administrative**
Principle 7: Compilation of a Broad Array of Treatment Options	
Criterion 7.1: consideration of a variety of treatment methods	**Administrative**
Criterion 7.2: regular addition of new treatment methods	**Administrative**
Criterion 7.3: emphasize prevention/biological-ecological control	**Environmental**
Principle 8: Accounting for Economic and Ecological Effects of Treatments	
Criterion 8.1: cost effectiveness (economics, environment)	**All**
Criterion 8.2: promotion of non-chemical treatment methods	**Environmental**
Criterion 8.3: judicious use of chemical treatment methods	**Environmental**
Criterion 8.4: pesticide use record keeping	**Administrative**
Criterion 8.5: maintenance of equipment to prevent fluid leaks	**Environmental**
Criterion 8.6: chemical/container disposal	**Environmental**

Table 2-1 (continued)
Connecting the EPRI IVM Standards with Sustainability Elements.

EPRI IVM Standards -- Principles and Criteria*	Sustainability Element
Criterion 8.7: non-use of exotics in planting	**Environmental**
Criterion 8.8: special sites (e.g., cultural, ecological) are conserved	**Environmental / Socio- economic**
Principle 9: Site-Specific Implementation of Treatments	
Criterion 9.1: small-scale land management unit designation	**Environmental**
Criterion 9.2: written prescriptions/operational plans	**Administrative**
Criterion 9.3: inventories as a basis for prescription / treatment	**Administrative**
Principle 10: Adaptive Management and Monitoring	
Criterion 10.1: monitoring implementation of management plans	**Administrative**
Criterion 10.2: monitoring vegetation management activities/effects	**Administrative**
Criterion 10.3: periodic revision of plans based on monitoring	**Administrative**
Criterion 10.4: public summary of monitoring results	**Socio-economic**

* See Appendix B for more detailed descriptions of each criteria.

3
STUDY 2: EVALUATION OF THE ELECTRIC INDUSTRY'S COMMITMENT TO SUSTAINABILITY AND INTEGRATED VEGETATION MANAGEMENT

In the previous sections of this report, the concept of sustainability was defined, and the fact was developed that Integrated Vegetation Management (IVM) on electric transmission line ROWs, as framed by the EPRI IVM Performance Standards, is a complete model of sustainability. In this report section, the commitment of the electric industry to sustainability was judged based on the degree that sustainability and vegetation management are portrayed to the public via company websites.

Study Objective

Judge the degree of electric utility organization self-portrayal of efforts in sustainability and related efforts with vegetation management on transmission rights-of-way, answering the following three questions:

1. Have the electric utilities embraced sustainability?
2. Is vegetation management portrayed in a light of sustainability?
3. Is vegetation management portrayed at all?

Methods

An assessment metric was constructed to evaluate the coverage, accessibility and connectedness of sustainability and vegetation management on electric transmission line ROWs (Appendix C). A point system was developed to grade each website: 40 points for sustainability, 40 points for vegetation management and 20 points for the connection between sustainability and vegetation management, for a total possible score of 100. Overall scores were judged for their portrayal of sustainability and vegetation management according the following percentage scheme (applicable to category and overall scores):

< 60% of points	Significant shortfalls; half or more of possible information missing
60-69%	Slight to significant shortfalls
70-79%	Slight shortfalls
80-89%	Full portrayal; all elements present
90+%	Excellent; exceptional depth and detail of portrayal

The metric was applied to the websites of the 29 standing members of EPRI's Rights-of-Way Program 57 in August-September 2009 (see list of member participants in Appendix D). Up to 15 minutes was spent by the Principal Investigator (C. Nowak) evaluating each company's main website during August-September 2009.

Mean and median (midpoint score, where one half of the company's scores are higher and one half lower) values were calculated for each of the three evaluations categories (portrayal of sustainability, vegetation management, and the connection made by the company between sustainability and vegetation management) and the total scores.

An account of the three best websites (only three to receive a score of >60 points total, or >60%) are presented as part of the results.

Results

Portrayal of Sustainability

Mean score of websites for the portrayal of sustainability was 10.2 (out of 40 points) (25.5%) (Figure 3-1). Ten of 29 companies did not receive any points – there was no portrayal of sustainability. Median score was 3.0

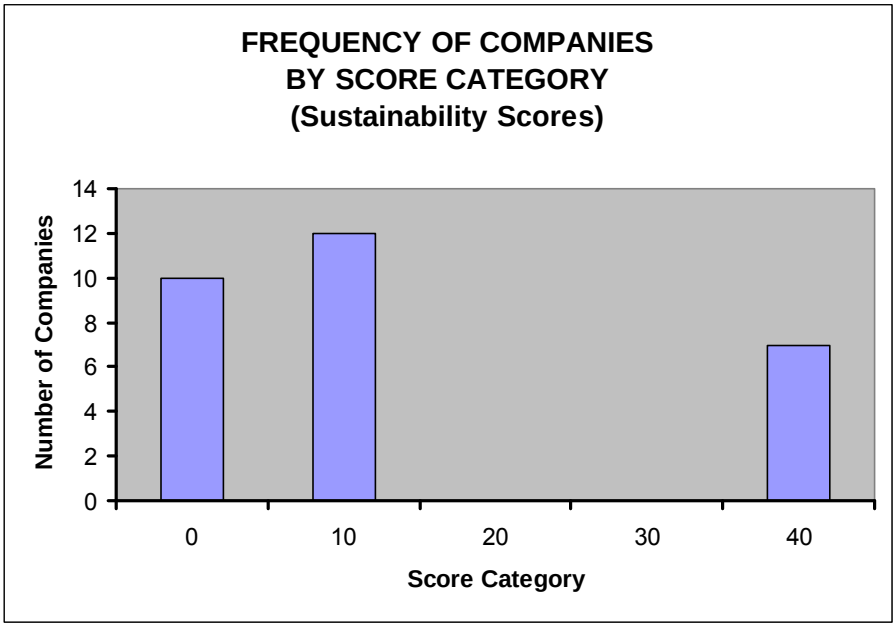

Figure 3-1
Scored portrayal of information on sustainability from EPRI Rights-of-Way Program 57 member company websites.

Portrayal of Vegetation Management

Mean score of websites for the portrayal of vegetation management was 7.7 (out of 40 points) (19.2%) (Figure 3-2). Twelve of 29 companies did not receive any points – there was no portrayal of vegetation management. Median score was 3.0

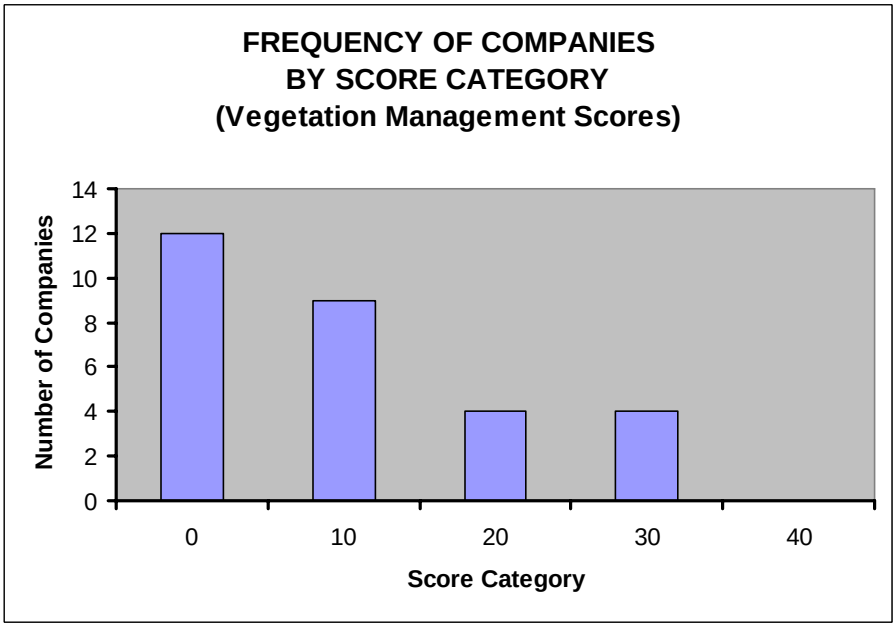

Figure 3-2
Scored portrayal of information on vegetation management from EPRI Rights-of-Way Program 57 member company websites.

Portrayal of Connection Between Sustainability and Vegetation Management

Mean score of websites for the portrayal of connection between sustainability and vegetation management was 1.8 (out of 20 points) (9.0%) (Figure 3-3). Twenty one of 29 companies did not receive any points – there was no portrayal of a connection between sustainability and vegetation management. Median score was 0 (zero).

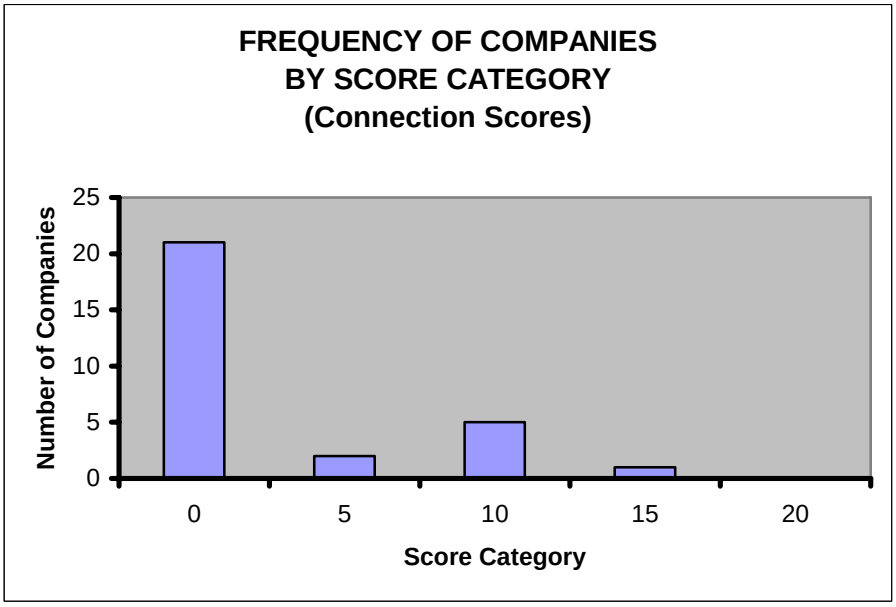

Figure 3-3
Scored portrayal of the connection between sustainability and vegetation management from EPRI Rights-of-Way Program 57 member company websites (n=29).

Total Portrayal of Sustainability and Vegetation Management

Mean score of websites for the total portrayal of sustainability and vegetation management was 19.6 (out of 100 points) (19.6%) (Figure 3-4). Seven of 29 companies did not receive any points – there was no portrayal of both sustainability and vegetation management. Median score was 10.0.

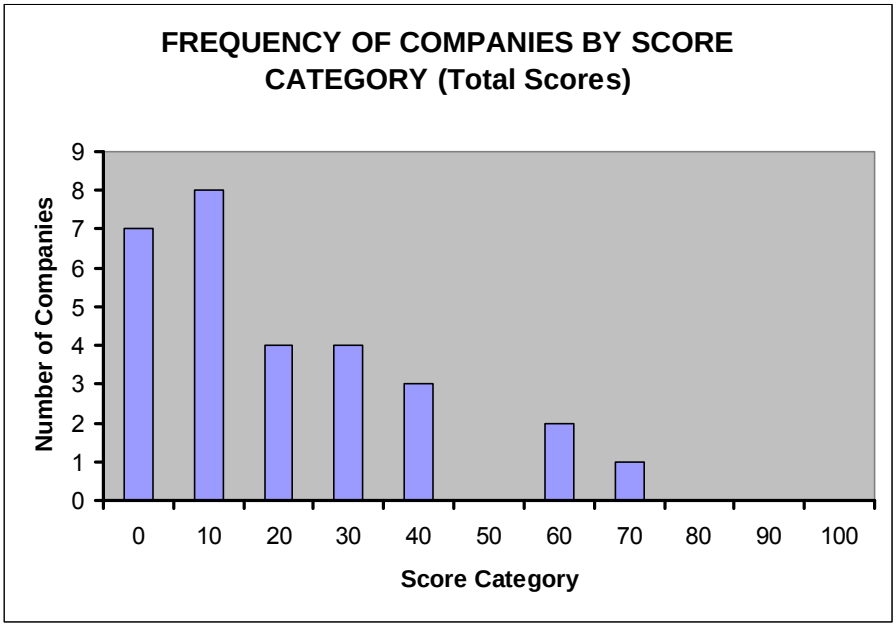

Figure 3-4
Scored portrayal of the total information on both sustainability and vegetation management from EPRI Rights-of-Way Program 57 member company websites (n=29).

Interpretation

Results from the study provide answers to the following questions (from the Objectives for this study):

1. Have the electric utilities embraced sustainability? **ANSWER: <u>In general, no.</u>**
2. Is vegetation management portrayed in a light of sustainability? **ANSWER: <u>In general, no.</u>**
3. Is vegetation management portrayed at all? **ANSWER: <u>In general, no.</u>**

Websites of EPRI's Right-of-Way research program (Program 57) generally have significant shortfalls in their portrayal of both sustainability and vegetation management. Yet, a few companies did well in portrayal, with three companies reaching total scores above 60 points – American Electric Power Service Corporation, Duke Energy Corporation, and Hetch Hetchy Water & Power (see SIDEBAR No. 2: Electric Utility Companies with High Level Portrayal of Sustainability and Vegetation Management). The idea of embracing and portraying sustainability and/with vegetation management in the electric utility industry does then have some precedence, as evidenced by these three companies – it can be done.

SIDEBAR No. 2: Electric Utility Companies with High Level Portrayals of Sustainability and Vegetation Management

American Electric Power Service Corporation

Notable: Ready access to a "2009 Corporate Sustainability Report" (main page)

Notable: Photo of a transmission line and tower on the main page

Website (accessed November 13, 2009): http://www.aep.com

Duke Energy Corporation

Notable: Named one of North America's leading companies in measures of financial, environmental and social performance via the Dow Jones Sustainability Index for North America, which evaluates companies for their long-term, responsible approach to business.

Notable: GRI Report (Global Reporting Initiative) (self declared), which features environmental, social and economic indicators

Website (accessed November 13, 2009): http://www.duke-energy.com/environment/sustainability/sustainability-index.asp

Hetch Hetchy Water & Power

Notable: Sustainability Plan and Program 2008

Notable: clear and accessible commitment to Integrated Pest Management as the basis for vegetation management

Website (accessed November 13, 2009): http://sfwater.org/mc_main.cfm/MC_ID/20

4
OVERALL SUMMARY AND SYNTHESIS

This report was a short primer on a complicated subject. It introduced sustainability, placed it in historical context, and listed some of its benefits to industry. Integrated Vegetation Management on electric transmission line rights-of-way was shown to be a ready model of sustainability. A review of utility companies and their websites indicated that this IVM model is not readily used by the electric industry to proclaim company efforts in sustainability. In fact, most companies do not claim to be conducting business in a sustainable manner, using IVM or not.

Vegetation management on electric transmission line ROWs is, in the eyes of the investigator (C. Nowak), a "jewel" of industry work in light of sustainability. It is one of the most tangible ways that the electric industry demonstrates full application of sustainability concepts – specifically showing on a regular basis how a company strives to balance environmental sensitivities with socio-economic responsibilities as guided by viable administrations. This jewel of the industry – Integrated Vegetation Management – should be applied on electric transmission line ROWs, and burnished and shown to proclaim to society that sustainability is indeed fully in place.

It is expected that interest in sustainability by electric utility stakeholders will continue to grow, and that the electric industry should be aware of that interest and growth so as to continue serving society and self in the fullest manner. IVM is a ready way to do so.

5
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A
A BRIEF HISTORY OF SUSTAINABILITY

Sustainability is relatively new principle based on old ideals (Floyd 2002). Basic precepts of sustainability have guided human activity for as long as there has been society – make sure that what we do today does not negatively affect what people, particularly our children, can do in the future. The idea of "doing unto others as you would have them do unto you" is related here, and has been woven into the fabric of many religions and societies for millennia.

Specific ideas and action about sustainability, through conservation and stewardship first, became real in the European Middle Ages when the use of natural resources over time was first observed to be keyed to the interrelationships among growing human populations, uses of the forest, agricultural productivity and water quality and abundance. Balance of rights to natural resources among community, church and government (royalty) were controlled for the first time by both customs and laws. True, purposeful conservation occurred starting in the 1600s with the advent of the scientific method as a basis for knowing how the world works, which led to the beginnings of a science and technology approach to efficiently allocate natural resource to meet social needs, including both the present and the future.

Beginning in North America in the 1800s, the use of natural resources for just material well-being was shifted to thinking of nature as "morally instructive" (Floyd 2002). The shift was in concert with the transcendental movement. This is a critical concept to the modern concept of sustainability – that nature has important, intrinsic value that we have responsibility to embrace and preserve. In addition to there being a utilitarian side to natural resources, there was now a preservation side. At the same time, various democratic governments were focusing on policies and laws to aid in the resolution of common societal problems via face-to-face dialog – the first inklings of stakeholders as an important part of natural resource decision making, which is a cornerstone of sustainability today.

After the Civil War, the utilitarian approach to conservation was at the fore with a focus on natural resources management that looked to meet the needs of the current generation with efficient, scientific management by trained professionals who would make the decisions for the public. In the early 20th century, Gifford Pinchot (the "father" of forestry and the United States Forest Service in the United States) extolled this approach and added that management of the Nation's forests should be done for the "greatest good of the greatest number in the long run", very much in line with today's broad perspectives on sustainability—taking care of both the present and the future. Forest and natural resources management in the United States were at the lead of the "conservation" movement that gradually evolved into a "multiple use/sustained yield" approach in the 1960s. Forest and associated natural resources were managed on public lands to produce water, recreation, wildlife, wood and grazing. In addition to multiple use, The Wilderness Act came into effect in 1964, fixing large portions of public lands to be forever wild – which met the preservation approach to natural resources. In the 1970s, public lands

management was opened to a broad array of stakeholders with their expanded role as commenter on natural resources decision making via the National Forest Management Act. At nearly the same time, the National Environmental Protection Act was put into effect, causing federal land managers to exhaustively examine the short and long-term cumulative effects of proposed management. These policies and laws evolved into a more general sustainability paradigm in the 1980s and 1990s where the focus of management is set on determining how to balance utilitarian with preservation perspectives via full consideration of the environmental, social and economic effects of management over broad scales of both time and space.

The world outside of forestry (although still often focused on forest ecosystems, particularly tropical forests) began to embrace sustainability as a central focus of development (Burger 2000). Pre-1960, development was seen as an economic affair alone, with a country's development gauged by its material growth. The environmental movement of the 1960s caused the United Nations and other international institutions to bring the environment into consideration for long-term development. In the 1970s, environment was opposed to economics as the basis for development. In the 1980s, it was set that sustainable development could occur only if the long-term health of the environment was balanced with economics. The first formal definition of sustainable development (and thereafter "sustainability") was put forth at this time by The Brundtland Commission (1987): *Development that meets the needs of the present without compromising the ability of future generations to meet their own needs*. In 1992, at the United Nations' World Conference on Environment and Development in Rio de Janeiro, the Brundtland definition was extended to include frameworks and principles to measure sustainability – actions could be judged for their degree of sustainability based on measures of economically viability, social justice and environment soundness (see Figure 1). The 1992 UN conference led to the Biodiversity Convention and the Framework Convention on Climate Change, wherein the importance of forests to sustainable development was framed and a definition of sustainable forest management developed through a statement on criteria and indicators via what today is known as the Montreal Process. In a separate, related effort in Helsinki in 1993 (Conference on Security and Cooperation), criteria and indicators were developed for the sustainable management of boreal and temperate forests. Third-party certification evolved as a means of marketing and expanding the implementation of sustainable forest management. Today, millions of hectares of forest land have been certified as being well-managed and sustainable by various certification bodies.

While forestry and natural resources management has been at the center of the recent (last few centuries) development of a sustainability principle, other segements of society have embraced the principle (see Introduction). We can expect this growth in the interest in sustainability to continue and that many succeeding businesses will have a sustainability philosophy central to their operations over the early part of the 21st century. On the rise today are corporate investments in sustainability programs, new types of environmental markets, and public demand for "green" products (Fields 2002). Each year companies like WalMart, Disney, Ford Motor Company, Intel and Dow Chemical publish sustainability reports. Hundreds, if not thousands, of such corporate commitments to and reports on sustainability are made each year.

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B
EPRI STANDARDS FOR ASSESSING PERFORMANCE OF INTEGRATED VEGETATION MANAGEMENT ON RIGHTS-OF-WAY

Principle #1: Compliance with Laws

Laws and regulations are constructs developed to protect natural resources and associated benefits and values accruable to society. IVM practitioners meet or exceed all laws, regulations, and guidelines related to vegetation management on ROWs.

1.1. Vegetation management shall respect all national, state, and local laws and regulations, for example, use of pesticides by certified applicators, Best Management Practices and other protective measures for water quality that exist within the state or other appropriate jurisdiction(s) in which the operations occur.

1.2. Vegetation management areas should be protected from unauthorized activities.

1.3. Managers and practitioners shall demonstrate a long-term commitment to adhere to the IVM Principles and Criteria.

a) Where opportunities afford, IVM Principles and Criteria are explicitly supported in the public arena.

b) Commitment is well defined via environmental policy.

Principle #2: Tenure and Use Rights And Responsibilities

Sustainable land management, including vegetation management, requires that the land be properly vested, clearly owned, and demarcated.

2.1. Clear evidence of long-term land use rights (e.g., land title or lease agreements) shall be demonstrated, including clearly identified, on-the-ground land boundaries.

2.2. Appropriate mechanisms shall be employed to resolve disputes over tenure claims and use rights.

a) Resource conflicts with adjoining landowners or other resource users are resolved or being addressed in a systematic and legal manner.

Principle #3: Community Relations and Workers' Rights

IVM shall maintain or enhance long-term social and economic well-being of vegetation management workers. A fairly compensated, respected, knowledgeable workforce is critical to long-term, sustainable vegetation management.

3.1. The rights of workers to organize and voluntarily negotiate with their employers shall be guaranteed as outlined in Conventions 87 and 98 of the International Labor Organization (ILO).

a) Managers and their contractors develop effective and culturally sensitive mechanisms to resolve disputes between workers and management.

b) Workers are free to associate with other workers for the purpose of advocating for their own employment interests.

3.2. The communities adjacent to the vegetation management area should be given opportunities for other professional services from the vegetation manager such as: representation in local civic activities, e.g., Earth Day cleanup, Arbor Day plantings, etc. contribution to public education about vegetation management practices in conjunction with schools, community colleges, and/or other providers of training and education.

3.3. Vegetation management meets or exceeds all applicable laws and regulations covering health and safety of employees, including the development and implementation of safety programs and procedures that include the following:

a) well-maintained and safe machinery and equipment;

b) use of safety equipment appropriate to each task;

c) documentation and posting of safety procedures in the workplace;

d) education and training;

e) contracts with safety requirements; and

f) safety records, training reports, and certificates.

3.4 Appropriate mechanisms are employed for resolving grievances and for providing fair compensation in the case of loss or damage affecting the legal or customary rights, property, resources, or livelihood of local peoples. Measures shall be undertaken to avoid such loss or damage.

a) Managers attempt to resolve grievances and mitigate damage resulting from management activities through open communication and negotiation prior to legal action.

b) Managers and their contractors have adequate liability insurance.

3.5 Workers are fairly compensated for work, especially in wage levels as matched to the degree of skill and difficulty in job.

Principle #4: Management Planning

Documentation of philosophy, principles, procedures and practices are critical to long-term, sustainable management, as embodied by various levels of plans, including resource inventories and maps. Written plans cause managers to be held highly accountable for both successes and failures as judged against stated goals and objectives. Improvement in management practices are predicated on learning from both successes and failures.

4.1. A strategic management plan and supporting documents must be in place that provide:

a) Management policy and objectives.

b) Description of the resources to be managed (e.g., water, soil, wildlife, aesthetics) and socioeconomic conditions, and a profile of adjacent lands.

c) Description of the vegetation management system, based on the ecology of the ecosystem in question and information gathered through resource inventories.

d) Provisions for monitoring, including feedback mechanisms for revising procedures as appropriate to more effectively achieve objectives.

e) Environmental limitations and safeguards, based on environmental assessments.

f) Plan for biodiversity.

g) Maps describing the resource base.

4.2. Tactical management plans are developed that report local considerations and activity plans on a year-by-year basis.

4.3. Strategic and tactical management plans shall be periodically revised to incorporate the results of monitoring or new scientific and technical information, as well as to respond to changing environmental, social, and economic circumstances.

4.4. A summary of vegetation management activities is produced annually, and both strategic and tactical management plans are revised at least every 10 years.

4.5. Workers shall receive adequate training and supervision to ensure proper implementation of the management plans.

4.6 Organization infrastructure, e.g., vegetation treatment equipment, including computers and GPS, is well developed and maintained to ensure proper implementation of the management plans.

4.7 While respecting the confidentiality of information, vegetation managers shall make publicly available a summary of primary elements of the management plan, including those listed in Criterion 4.1.

Principle #5: Understanding Pest and Ecosystem Dynamics

Knowledgeable managers and practitioners are needed. Being able to identify pests and desirable organisms in the managed system, and understanding the ramifications of management based on knowing life histories and ecosystem processes, is foundational knowledge for IVM.

5.1 Vegetation managers are knowledgeable about the managed ecosystem, especially with regard to the basic biology and ecology of all organisms in the system, and the environment in which they live.

5.2. Research and development activities are engaged to produce missing basic information on ecology of the managed ecosystem.

5.3. Vegetation managers and practitioners are provided opportunities to improve their skills and knowledge through training.

Principle #6: Setting Management Objectives and Tolerance Levels

IVM, as developed from IPM, depends upon basic elements to function as a system. Tolerance levels are one of the top elements as part of IVM, whereby vegetation is only treated if critically necessary to meet objectives. Objectives are set in context of socioeconomics and environmental desires.

6.1. Management planning, including the development of management objectives, shall incorporate the results of evaluations of social impact. Consultations shall be maintained with people and groups directly affected by management operations (see also Criterion 6.3 and PRINCIPLE #4).

6.2. Tolerance levels are used to develop thresholds for when vegetation management activities are applied to control vegetation.

6.3. People and groups affected by management operations are apprised of proposed vegetation management activities and associated environmental and aesthetic effects in order to solicit their comments or concerns.

6.4. Significant concerns identified in Criteria 6.1 and 6.3 are addressed in management policies and plans (for example, management activities are modified in response to concerns, or a rationale is provided for not responding to a concern).

Principle #7. Compilation of a Broad Array of Treatment Options

IVM does not focus on the use of one treatment; instead, every ROW management situation has a treatment prescribed only after considering all possible treatments. A full "toolbox" of treatments is needed to make this consideration full and robust.

7.1. A wide variety of different mechanical, physical, chemical, cultural, and biological/ecological treatments are available for use/consideration on all sites.

7.2. New treatments are progressively evaluated and added to the vegetation management program, with emphasis on non-herbicide alternatives.

7.3. Where possible, treatments are featured that lead to, directly or indirectly, pest prevention and biological and ecological control of pests.

Principle #8: Accounting for Economic and Ecological Effects of Treatments

Cost effectiveness of treatments, in its broadest sense, is used as a basis for selecting treatments. A conservative, environmental approach is used that favors prevention. If control is needed, there is an effort to use non-synthetic pesticide alternatives and biological approaches.

8.1. Vegetation management should strive toward economic viability, while taking into account the full environmental, social, and operational costs of vegetation management. Treatment choices are made with full consideration of cost effectiveness, including a wide array of positive and negative environmental externalities.

a) Water resources: perennial and ephemeral streams, wetlands, vernal pools, seeps (see also Criterion 8.5).

b) Wildlife: common plants, animals and their habitats, and imperiled, threatened, and endangered species and their habitats (according to state and federal statutory listings).

c) Biodiversity: efforts are made to control invasive, exotic plants; also, if state or federal listings and species databases indicate the likely presence of a rare, threatened or endangered species or plant community type, either a survey is conducted prior to management activities being carried out (to verify the species presence or absence) or the vegetation manager manages as if the species were present. If an applicable species and plant community type is determined to be present, its location is reported to the manager of the applicable database, and necessary modification are made in both the management plan and its implementation.

d) Aesthetics: visual impacts of treatments are assessed.

Written guidelines shall be prepared and implemented to address management of these resources.

8.2. Management systems shall promote the development and adoption of environmentally-sensitive, non-chemical methods of pest management and strive to minimize the use of chemical pesticides. If chemicals are used, proper equipment and training shall be provided to minimize health and environmental risks. (see also Criterion 1.1)

8.3. Chemicals are used to control plants only when non-chemical management practices have proven ineffective or cost prohibitive.

8.4. When chemicals are used, a section is included in the prescription that fully describes the risks and benefits of their use and the precautions that workers must employ. Records are kept to document the occurrence of pests, measures to control them, and incidences of worker exposure to chemicals.

8.5. Broken and leaking equipment and parts are repaired and removed from a right-of-way as they may contaminate a site with fuel, oil, or other chemicals; discarded parts are taken to a designated disposal facility. Equipment is not parked in riparian zones, or near groundwater supplies, where fluid can leak into them.

8.6. Chemicals, containers, and liquid or solid non-organic wastes including fuel and oil shall be disposed of in an environmentally appropriate manner at off-site locations. (see also Criterion 1.1)

8.7. Use of exotic species in planting is minimized, carefully controlled, and actively monitored to avoid adverse ecological impacts. Furthermore, use of exotic plant species is contingent on peer-reviewed scientific evidence that any species in question is non-invasive and does not diminish biodiversity. If non-invasive exotic plant species are used, the location of their use is documented, and their ecological effects actively monitored.

8.8. Special cultural, ecological, economic or religious resources shall be clearly identified, recognized and protected by vegetation managers.

Principle #9: Site Specific Implementation of Treatments

ROWs should be divided into ecologically- and socioeconomically-sensible management zones. These zones have vegetation management plans (prescription) that are contemporaneous in development and benchmarks for future evaluations of treatment success.

9.1. Land management units are designated within right-of-way for areas that warrant different management treatments, for example, buffers to protect water resources, conservation areas, and vegetative communities that may cause a change in successional directions or rate.

9.2. Written prescriptions (or, operational plans) are used to describe/prescribe treatments on a land management unit basis, and justify treatment choices using ecological, socioeconomic, and administrative opportunities and constraints. Prescriptions should include the following:

a) land management unit designation;

b) description of current vegetation and environmental conditions;

c) desired future conditions;

d) definition of treatment;

e) justifications for treatment based on tolerance thresholds (also see PRINCIPLE # 6) and ecological, environmental, socioeconomic, and administrative considerations; and

f) site-specific maps that detail land management units, and show important cultural and environmental features.

9.3. Prescriptions and the decision to treat are based on contemporary inventories of vegetation and environmental conditions.

Principle #10: Adaptive Management and Monitoring

IVM has a self-improvement mechanism: vegetation management objectives are used to evaluate whether management outcomes are acceptable. Monitoring is the collection of appropriate data to judge successes and failures of vegetation management. Monitoring procedures should be consistent and replicable over time to allow comparison of results and assessment of change.

10.1 Implementation of the strategic and tactical management plans are periodically monitored to assess the following:

a) the degree to which the management vision, goals and objectives have been achieved;

b) deviations from the plan;

c) unexpected effects of management activities and other disturbances; and

d) social and environmental effects of management.

10.2. Vegetation management should include the research and data collection needed to monitor, at a minimum, the following indicators:

a) condition of the right-of-way;

b) composition and changes in the flora and fauna;

c) environmental and social impacts of operations;

d) chemical use; and

e) cost, productivity, effectiveness and efficiency of vegetation management.

10.3. Results of monitoring shall be incorporated into the implementation and revision of the management plan.

10.4. While respecting the confidentially of information, vegetation managers shall make publicly available a summary of the results of monitoring indicators, including those listed in 10.1.

C

METRIC FOR RATING WEBSITES FOR PORTRAYAL OF SUSTAINABILITY AND VEGETATION MANAGEMENT ASSOCIATED WITH ELECTRIC TRANSMISSION LINE MANAGEMENT

Rating by: Date:

COMPANY:

Transmission miles: Where:

Number of customers:

Start time (15 minute limit): End time:

Total points: ____ / 100

Sectional points: ____ / ____ / ____

40 / 20 / 40

SUSTAINABILITY (___ / 40 pts)

____ 10 pts "Sustainability" word on main page
other like words – green, conservation, stewardship (3 pts)

____ 20 pts "Sustainability" presented as policy, principle and practices – in depth
e.g., reports and descriptions
e.g., commitment to sustainability via ISO 14001

____ 10 pts Accessibility to information on sustainability
time and tiers / links needed to find information (ease / difficulty)

SUSTAINABILITY – VEGETATION MANAGEMENT LINKAGE (___ / 20 pts)

____ 20 pts "Sustainability" and "Vegetation Management" are linked, connected

VEGETATION MANAGEMENT (___ / 40 pts)

____ 10 pts "Vegetation Management" words/phrase on main page

____ 20 pts "Vegetation Management" policy, principle and practices – in depth
e.g., plans and descriptions, reports, brochures

____ 10 pts Accessibility to information on vegetation management
time and tiers / links needed to find information (ease / difficulty)

COMMENTS:

D
EPRI'S 2009 RIGHTS-OF-WAY PROGRAM 57 MEMBERSHIP LIST

Table D-1
EPRI's 2009 Rights-of-Way Program 57 Membership. Websites from these companies were judged for portrayal of information on both sustainability and vegetation Management (see Section 3 of this report).

American Electric Power Service Corporation
American Transmission Co.
Arkansas Electric Cooperative Corp.
Buckeye Power, Inc.
CenterPoint Energy, Inc.
Central Hudson Gas & Electric Corp.
Dairyland Power Cooperative
Duke Energy Corp.
E.ON US
Entergy Services, Inc.
Georgia Transmission Corporation
Golden Valley Electric Assn., Inc.
Great Plains Energy
Great River Energy
Hetch Hetchy Water & Power
Hoosier Energy Rural Electric Coop., Inc
Hydro One Networks, Inc.
Integrys Energy Group, Inc.
Lincoln Electric System
Nebraska Public Power District
New York Power Authority
Pepco Holdings, Inc.
PNM Resources
Public Service Enterprise Group, Inc.
Salt River Project
Southern Company
Tri-State G&T Association, Inc.
We Energies
Western Area Power Administration

Export Control Restrictions

Access to and use of EPRI Intellectual Property is granted with the specific understanding and requirement that responsibility for ensuring full compliance with all applicable U.S. and foreign export laws and regulations is being undertaken by you and your company. This includes an obligation to ensure that any individual receiving access hereunder who is not a U.S. citizen or permanent U.S. resident is permitted access under applicable U.S. and foreign export laws and regulations. In the event you are uncertain whether you or your company may lawfully obtain access to this EPRI Intellectual Property, you acknowledge that it is your obligation to consult with your company's legal counsel to determine whether this access is lawful. Although EPRI may make available on a case-by-case basis an informal assessment of the applicable U.S. export classification for specific EPRI Intellectual Property, you and your company acknowledge that this assessment is solely for informational purposes and not for reliance purposes. You and your company acknowledge that it is still the obligation of you and your company to make your own assessment of the applicable U.S. export classification and ensure compliance accordingly. You and your company understand and acknowledge your obligations to make a prompt report to EPRI and the appropriate authorities regarding any access to or use of EPRI Intellectual Property hereunder that may be in violation of applicable U.S. or foreign export laws or regulations.

The Electric Power Research Institute, Inc. (EPRI, www.epri.com) conducts research and development relating to the generation, delivery and use of electricity for the benefit of the public. An independent, nonprofit organization, EPRI brings together its scientists and engineers as well as experts from academia and industry to help address challenges in electricity, including reliability, efficiency, health, safety and the environment. EPRI also provides technology, policy and economic analyses to drive long-range research and development planning, and supports research in emerging technologies. EPRI's members represent more than 90 percent of the electricity generated and delivered in the United States, and international participation extends to 40 countries. EPRI's principal offices and laboratories are located in Palo Alto, Calif.; Charlotte, N.C.; Knoxville, Tenn.; and Lenox, Mass.

Together…Shaping the Future of Electricity

Program:

ROW: Siting, Vegetation Management, and Avian Issues

1017963

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