

**Unbundling Electricity-Related Services**  
**Public Service Commission of Utah**  
**Report to the**  
**Electrical Deregulation and Customer Choice Task**  
**Force**  
**June 1, 1998**

**Table of Contents**

I. Executive Summary .....	p. 3
II. Introduction.....	p. 6
A. Background and Purpose.....	p. 6
B. The Industry in Utah .....	p. 7
C. Principles of Unbundling.....	p. 8
D. Overview of Unbundling of Electric Services.....	p. 9
III. Identification of Unbundled Services.....	p. 11
IV. Unbundled Services.....	p. 13
A. List by Function.....	p. 13
B. Criteria for Evaluating.....	p. 14
C. Evaluation of Electric Services.....	p. 16
V. Summary of Parties=Positions.....	p. 23
VI. Conclusions, Suggestions and Options.....	p. 28

# I. Executive Summary

The 1997 Utah Legislature passed H.B. 313 setting in motion possible profound changes in the way Utahns receive their electric service. The Legislature reaffirmed that its policy goals in this endeavor include: providing safe, reliable and reasonably priced electricity to all consumers; permitting consumers to choose services and suppliers at market-determined prices; to allow all consumers to enjoy access to alternative suppliers of services and to enjoy the benefits of a competitive market; to prevent unfair cost-shifting among customer classes; to stimulate economic growth; and to encourage innovation and efficiency.

Unbundling electric service -- that is, separately pricing and selling all of the services that comprise today's bundled utility service -- is the prerequisite for introducing and developing competition in Utah's electric industry. Unbundling could enable a competitive market to develop in some services, so that customers could choose services they need, decline those that they do not, and presumably pay less.

Pursuant to a request from legislators, the Public Service Commission prepared this report to discuss the general issues associated with unbundling electric services. We consulted with all interested parties and evaluated their comments. Of the services that are potential candidates for unbundling, the report suggests ways to evaluate them against various technical and economic criteria to determine *which* of those services it appears could be unbundled, and *how* to start the process. In summary, preliminary study suggests that at least from a technical (i.e. engineering) standpoint, certain electric services might be unbundled. See Table 1. But whether they can be competitively provided needs further economic analysis.

This is a preliminary analysis and its primary focus is on the technical feasibility of unbundling. Further study is necessary, particularly of the economic feasibility of unbundling these services. Economic analysis will help understand whether unbundling, a key aspect of restructuring the electric industry, will fulfill its promise of savings and benefits to all customers, and otherwise fulfill the policy goals articulated in H.B. 313.

On the basis of the comments received, and its own experience, the Commission believes that the process must proceed carefully and in stages; that further study is critical; and that a combination of formal and informal methods be used. Parties suggest using some of the decisions from the currently-pending PacifiCorp rate case as a baseline, and then following with informal technical conferences with interested parties, and formal proceedings where the evidentiary record needed to support actual decisions can be created.

**TABLE 1. SERVICES WHICH MAY BE UNBUNDLED**

CATEGORY OF SERVICE	YES, probably can be unbundled	NO, probably cannot be unbundled	POSSIBLE, but doubtful; more investigation warranted
<b>I. Generation Services</b>			
<b>I.1. Generation Capacity and Energy Supply</b>			
I.1a. Generation Capacity	x		

I.1b. Energy Supply	X		
I.1c. System Black Start Capability		X	
I.1d. Backup Supply	X		
I.1e. Load Following	X		
<b>1.2 Generation Services Necessary to Support Transmission Service</b>			
1.2a. Regulation and Frequency Response		X	
1.2b. Energy Imbalance	X		
1.2c. Loss Compensation	X		
1.2d. Reactive Supply and Voltage Control from Generation Sources			X
1.2e. Operating Reserves - Spinning Reserve Service	X		
1.2f. Operating Reserves - Supplemental	X		
<b>II. Transmission Service</b>			

<b>II.1. Provision and Maintenance of Wires</b>		x	
<b>II.2. Ancillary Services</b>			
II.2a. Scheduling, System Control and Dispatch Service		x	
II.2b. Network-Stability Services		x	
II.2c. Dynamic Scheduling			x
	<b>YES</b>	<b>NO</b>	<b>POSSIBLE</b>
<b>III. Distribution Service</b>			
<b>III.1. Provision and Maintenance of Wires</b>		x	
<b>III.2. Ancillary Distribution Services</b>			
III.2a. Reactive Supply and Voltage Control			x
III.2b. Loss Compensation Service - Distribution			x
<b>III.3 End-Use Metering</b>			
III.3a. Ownership			x
III.3b. Operation and Maintenance			x

III.3c. Meter Reading			X
<b>III.4 Customer Accounting</b>			
III.4a. Billing			X
III.4b. Uncollectibles			X
III.4c. Account Services			X
III.4d. Payment Collection and Processing			X
III.4e. Customer Information and Data Processing			X
<b>IV. Other Services</b>			
<b>IV.1. Arranging for Power Supplies</b>	X		
<b>IV.2. Public Goods Services</b>			
IV.2a. Demand-Side Management	X		
IV.2b. Low-Income Assistance		X	
IV.2c. Low-Cost Energy Audits	X		
IV.2d. Provision of Renewable Resources			X

## II. Introduction

### A. Background and Purpose

In the 1997 legislative session, the Utah Legislature considered whether electric industry restructuring is in the public interest and passed H.B. 313 which established the Electrical Deregulation and Customer Choice Task Force. The Task Force began studying the issue in 1997. The 1998 Legislature passed resolution H.J.R 7, which states that electric restructuring is to the long-term benefit of the citizens of the state. To aid in its continuing deliberations, Task Force Co-Chairman Senator Leonard Blackham proposed S.B. 67, requiring that the Utah Public Service Commission perform a series of studies on industry restructuring and report back to the Task Force. Though the bill was withdrawn, legislative and Task Force leadership asked the Commission to perform the studies.

On March 12, 1998, the Commission issued a memorandum to interested parties describing the legislative request, requesting comments and setting a schedule. By memorandum dated April 1, 1998, we gave parties a preliminary list of services considered candidates for unbundling and asked for comments on whether the list is complete and any proposed additions or deletions. We also asked parties to suggest the technical and economic base to judge which elements could be provided by firms in an unregulated market. We received nine responses to this request for information. These came from the investor-owned utility (PacifiCorp); two public providers of electricity (Utah Rural Electric Association, UREA, and Utah Association of Municipal Power Suppliers, UAMPS); Enron; two groups of large industrial customers (Utah Electric Deregulation Group, UEDG, Utah Industrial Energy Consumers, UIEC); two state agencies (the Division of Public Utilities and the Committee of Consumer Services); and the Salt Lake Community Action Program (CAP). In general, commenting parties accepted the list, with some additions or deletions. They suggested what a good analysis might require and described the process by which decisions about unbundling should be reached. This report on unbundling of electric services is the first of four reports we have been asked to prepare.

The purpose of this report is to provide the Utah Legislative Task Force with information concerning the unbundling of electric services in the state of Utah. Unbundling of electric services must be viewed within the context of electric industry restructuring and, in fact, is a requirement of any such restructuring. The industry is currently organized as vertically integrated monopolies, which provide a bundled product (electricity delivered to the meter) to all customers within its certificated service territory. It is generally recognized that transmission and distribution of electricity will remain regulated while electric generation will be opened to competition. Unbundling of services will allow consumers to choose their suppliers of the competitive services. This report will provide background information about the unbundling process so policymakers can understand the implications of unbundling and restructuring. The Commission recommends a thorough analysis in order to judge how to proceed with a competitive offering of electric services.

### B. The Industry in Utah

The electric industry in Utah consists of one major investor owned utility (IOU), PacifiCorp, seven rural electric associations (REAs or Co-ops), and approximately 41 publicly owned or municipal utilities. Each has its own financial, governing and regulatory structure, and territory in which it serves its customers.

#### 1. Investor Owned Utilities

PacifiCorp is an investor owned utility (IOU) regulated by the Utah Public Service Commission and the Federal Energy Regulatory Commission (FERC). Rates are set that allow the utility the opportunity to recover its costs and earn a fair rate of return on its investment. PacifiCorp, doing business in Utah as Utah Power is the sole IOU in Utah. Its service

territory spans most of the populated area of the state except the areas served by the REAs and the municipals. This vertically integrated utility operates in seven western states and owns approximately 12,500 MWs of generation capability of which 2,750 MWs are located in Utah. Utah Power is the state's largest utility serving a total of 567,268 customers or approximately 75% of all Utah customers. It owns 54% or 80% of all generation plant located in Utah depending on how the base is calculated. Over 80% of all electric energy consumed within the state is sold by Utah Power.

## 2. Rural Electric Cooperatives

Nine REAs serve about 5.5% of the State's customers and account for approximately the same percentage of sales in the state. The REAs obtain most of their power from Deseret Generation and Transmission (DG&T) and the Western Area Power Administration (WAPA), although some have their own small hydro facilities. DG&T is a generation and transmission cooperative formed to provide power to its member REAs. DG&T power comes mostly from its Bonanza coal-fired plant, while WAPA power is mostly hydro electric power from the Colorado River Storage Project, e.g., Glenn Canyon Dam. REAs are non-profit corporations, owned by their customers, which raise capital through federal loans and loan guarantees from the Cooperative Finance Corporation and from reinvestment of revenues. REAs are governed by boards of directors elected by members. The Utah Commission has limited jurisdiction over rates charged by the REAs.

## 3. Municipal Utilities

There are 41 publicly-owned, mostly municipal, utilities operating in the state. Such utilities are owned, operated and regulated by the individual municipal councils or governing boards. These utilities serve 144,000 customers or almost 20% of the customers in the state. Their sales amount to approximately 13% of state sales. Municipals receive their power from a variety of sources. They own approximately 100 MWs of coal-fired plant, 85 MWs of oil- and gas-fired plant and 40 MWs of small hydro. They are given preference to low-cost federally owned hydro power from the Colorado River Storage Project and purchase from other wholesale sources. These utilities are not under the jurisdiction of the Commission.

## 4. Federally-owned power and Utility Associations

There are a number of entities that own generation in the state. They include: DG&T, a generation and transmission cooperative; the Intermountain Power Agency, (IPA) an organization of 23 Utah municipalities formed to finance, construct and operate the Intermountain Power Project (IPP), a 1640 MW coal-fired power plant located in Millard County; Utah Associated Municipal Power Systems (UAMPS) and Utah Municipal Power Agency (UMPA), governmental agencies organized to provide wholesale electric services to their member municipalities on a nonprofit basis; and the Western Area Power Administration (WAPA), a federal agency which manages and sells hydro power from the Colorado River Storage Project.

## **C. Principles of Unbundling**

Unbundling electric service is accomplished by breaking out the components of traditional bundled services, assigning existing costs to the various service components, and developing prices based on these costs. However, accomplishing the economic and public policy goals of unbundling goes beyond the apportionment of costs to services. There may be competing objectives of unbundling and restructuring that require some general principles to help guide the process. We suggest the following principles.

1. Unbundling should facilitate fair competition for generation services. In other words, unbundling transmission and distribution services should not favor one generation service or provider over another.
2. Unbundling should aid the effort to make the electric system more efficient and reliable.

3. Rates for regulated unbundled services should recover the properly apportioned costs of these regulated services, and no more. Regulated services should not subsidize competitive ones.

4. Reciprocity between utilities and between states should be encouraged to facilitate competition and efficient markets. This reciprocity requirement means that there should be a uniform costing of services among all utilities; that is, the same costing procedure should be used by all utilities to insure that markets for unbundled services are compatible between utilities.

5. Unbundling is a continuous process. The initial attempts to price unbundled services will need refinement as better estimates of costs become available and as service functions and offerings are modified.

## **D. Overview of Unbundling Electric Services**

The public policy goal of electric restructuring is to lower electric service rates and improve services and products for customers by introducing competition and choice for those functions that might be provided by competing firms in less regulated markets. This requires the provision of a mix of competitive and regulated services which better supports efficient, reliable and affordable electric service to all consumers than does today's regulated industry. Electric restructuring will facilitate direct access for consumers to their choice of energy suppliers. Given that some sections or services of the industry will require continued regulation, unbundling is the necessary means to effect retail direct access between customers and providers of electricity.

Several stages are required to accomplish unbundling. First, bundled electric services must be unbundled. These services must be separated into discrete, independent functions which can be served by existing or new business entities. Second, the costs of these unbundled services must be carved out of the costs of the bundled service. The separated costs will be the basis for the prices of each new service. This will involve the application of cost allocation and accounting methods. The correct application of cost allocation is required to insure that the regulated services are priced at cost and do not subsidize competitively offered services. To insure that competition will flourish for these competitively offered services, some organizational changes of existing utilities may be required. This could range from functional unbundling to divestiture or corporate spin off of certain functions or services.

Third, in order to preserve the reliability of electric service, and to facilitate commercial exchange, essential electric services must be divided into two categories, those that are potentially competitive and those that should remain regulated services. At a minimum, a potentially competitive service should be (1) technically feasible for a variety of suppliers to provide the service and (2) be economically beneficial for suppliers to compete to provide the service, i.e., the prices paid by customers should fall or quality of service increase. The remaining regulated services either exhibit natural monopoly properties or are not amenable to competitive markets.

Fourth, the market and regulatory structures conducive to a reduction of overall costs to customers must be identified. This fourth stage will require analysis of market structure, regulatory practices, and the legal rights and obligations of utilities, customers, and other industry participants.

As shown in other states, the process may begin with a statute or rule, by which customers are permitted to choose an electricity supplier by a specified date. But prior to that date, a process will have been initiated to identify distinct components of electric service. Following public comment and an order or rule identifying these components, utility companies will be ordered to file the functionally separated costs of each service component. After formal hearing, an order is issued to establish tariffs for each distinct component of electric service. The tariffs are intended to enable electric service providers and consumers to engage in transactions for electric service. For many of these distinct electric services, separate costs have not heretofore been identified. That is why technical proceedings are required.

Unbundling issues will be complicated and controversial. Apportioning costs to jointly produced services is difficult. First, the principles and objectives of unbundling should be identified. The primary objectives should include lower rates to retail customers and choice of providers. Ultimately, accounting, cost apportionment, economics, engineering,

and legal details must be addressed. Unbundling should be viewed as an evolutionary process to be pursued on a trial-and-error basis. Jurisdictional authority to review and change service unbundling should be established to insure customers are well served by the initial decision to unbundle.

The long run policy goal of unbundling and restructuring is to lower prices paid for service, improve the quality of service, or both, by allowing customers to choose their service provider. Policymakers should be convinced that restructuring and unbundling will accomplish these goals before moving forward. In particular, policymakers should weigh the following factors which may have a detrimental impact on expected savings and efficiency gains:

Transactions costs increase as customers find that obtaining information and arranging electric service takes more resources, time and effort;

Utility efficiency decreases as restructuring/unbundling spins utility functions off to separate companies, causing the loss of economies of vertical integration;

The cost of regulation increases while its effectiveness in protecting core retail customers diminishes;

Costs of providing service shift from some customers to others when the costs of services produced jointly are apportioned to each of the newly unbundled services;

Service prices increase for households, businesses, and institutions that continue to take service, perhaps bundled service, from the utility because departing larger customers leave the utility with costs that can only be recovered from remaining customers.

### **III. Identification of Unbundled Services**

The vertically integrated utility firm controls and coordinates each stage of production, i.e., generation, transmission and distribution and includes the costs of each in the price for the service. The price is currently determined by the Public Service Commission, or by the governing boards of the REAs or municipal public utility. In an open access environment, these basic stages of production, i.e., generation, transmission, and distribution could be unbundled with separate prices charged for each. However, these categories can be further broken down into many distinct services. It is important that regulated and potentially competitive services be separated and priced according to cost. It is not in the interests of competition or consumers to have regulated services subsidize competitive services. Therefore, joint and common costs such as administrative and general expenses need to be properly allocated to the various functions. Correctly apportioning costs will be a difficult task because many distinct services are produced jointly by the same equipment.

Generation services may prove to be competitive as is generally assumed. Under deregulation, the pricing of such services would be left to market forces. Transmission services in general will continue to be a monopoly service regulated by the FERC. Likewise, distribution is considered a monopoly service that will continue to be regulated by the state (with the exception of REAs and municipal utilities). Within this broad framework, there still exists controversy regarding specific services and whether they should be regulated, and if so, by whom.

Below are two tables showing a hypothetical example of how in the most general terms services may be unbundled into separate components. Table 1 illustrates the general breakdown and how prices would be determined. Table 2 is a hypothetical breakdown of costs by service on a per kWh basis. Some states are requiring their utilities to list unbundled services and their prices as a beginning step even before unbundling.

TABLE 1

General Unbundling by Function	

Function	Price Determined by
Generation	Competitive Market
Transmission	FERC regulation
Distribution	PSC Regulation
Energy Services	PSC Regulation or Competitive Market

TABLE 2

Example of Functional Cost by Service per kWh			
Cost Function	Residential	Commercial/Industrial	Average
Generation: Fixed	\$.02/kWh	\$.01/kWh	\$.014
Variable	\$.015/kwh	\$.015/kWh	\$.015
Subtotal	\$.035	\$.025	\$.029
Transmission	\$.007	\$.004	\$.005
Distribution	\$.008	\$.004	\$.007
Customer	\$.02	\$.007	\$.014
<b>Total Cost</b>	\$.07	\$.04	\$.055

Unbundling becomes more complicated as the services are subdivided into more distinct components as the following section shows. Further delineation of services creates greater opportunity for potential entry of competitors and provides consumers with more choice, particularly if they don't need certain services or can self-produce a particular service. However, further delineation may lead to increased costs, customer confusion and problems with reliability.

## IV. Unbundled Services

### A. List By Function

Below is a list and description of electric service components that may be unbundled. The list is derived from work performed by the Nevada Public Utilities Commission (Order in Docket No. 97-8001) and the National Regulatory Research Institute (NRRI), however, we reorganized it to better reflect the structure of the industry. The services in this list are defined in section IV. C. It should be noted that there is not a general industry consensus on how to classify and categorize the different service functions. There are various degrees of delineation with some states using different nomenclature and classifying services under different categories. This lack of consensus may frustrate the development of regional markets and may lead policymakers to different conclusions regarding the potential for competitive

provision.

Parties that submitted comments to the Utah Commission suggested organizational changes to this list as well as some additions and deletions. Several suggested that informal hearing or technical conferences be held so a general consensus could develop on the classification of the various electric services. The industrial group recommended that we adopt the FERC nomenclature in order to minimize jurisdictional disputes and help create a regional market for these services. Both suggestions warrant further consideration.

## **I. Generation Services**

### **I.1. Generation Capacity and Energy Supply**

I.1.a. Generation Capacity

I.1.b. Energy Supply

I.1.c. System Black Start Capability

I.1.d. Backup Supply

I.1.e. Load Following

### **I.2. Generation Services Necessary to Support Transmission Service**

I.2.a. Regulation and Frequency Response

I.2.b. Energy Imbalance

I.2.c. Loss Compensation

I.2.d. Reactive Supply and Voltage Control from Generation Sources

I.2.e. Operating Reserves - Spinning Reserve Service

I.2.f. Operating Reserves - Supplemental Reserve Service

## **II. Transmission Services**

### **II.1. Provision and Maintenance of wires**

### **II.2 Ancillary Services**

II.2.a. Scheduling, System Control and Dispatch Service

II.2.b. Network-stability Services

II.2.c. Dynamic Scheduling

## **III. Distribution Services**

### **III.1. Provision and Maintenance of wires**

### **III.2 Ancillary Services**

III.2.a. Reactive Supply and Voltage Control

III.2.b. Loss Compensation Service - Distribution

### **III.3 End-Use Metering**

III.3.a. Ownership

III.3.b. Operation and Maintenance

III.3.c. Meter Reading

### **III.4. Customer Accounting**

III.4.a. Billing

III.4.b. Uncollectibles

III.4.c. Account Services

III.4.d. Payment Collection and Processing

III.4.e. Customer Information and Data Processing

## **IV. Other Services**

### **IV.1. Arranging for Power Supplies**

### **IV.2. Public Goods Services**

IV.2.a. Demand-side Management

IV.2.b. Low-income Assistance

IV.2.c. Low-cost energy audits

IV.2.d. Provision of renewable resources

IV.2.e. Protection of the environment

## **B. Criteria for Evaluating Potentially Competitive Unbundled Electric Services**

To distinguish the unbundled electric services that might be provided in an unregulated market from those that will continue to be regulated, an analysis of technical and economic characteristics must be performed. The service should pass both criteria before it can be considered as a deregulated service and offered in a competitive setting.

The technical criteria include:

- 1) whether the service can be unbundled to suppliers and customers
- 2) whether the system operator should provide or control delivery of the service
- 3) whether the service must be provided from inside the local control

area

4) whether the service is needed to maintain or restore bulk-power reliability (vs. whether the service is needed primarily for commercial, transactional purposes).

Such a technical analysis has been performed by the National Regulatory Research Institute (NRRI) for certain ancillary services. Their analysis identifies those services that could be competitively provided, although further investigation for a particular utility and geographic region is necessary.

The economic analysis should consider:

1) Ability to separate costs: The costs of the unbundled services must be able to be allocated based on actual incurrence of cost. Services that are jointly produced or have high percentage of common cost may be difficult to separate.

2) Economies of Scale: The sensitivity of changes in outputs resulting from changes in inputs.

3) Economies of Scope: The effect on costs of providing two or more outputs or services together rather than producing them separately.

4) Dimensions of Market Structure:

A. Definition of Relevant Market (Product and Geography).

B. Number and Size Distribution of Firms (Measures of Market Share).

C. Barriers to Entry and Exit: Capital requirements, proportion of fixed to total costs and associated risk, access to or control of low-cost or essential resources, economies of scale and scope, and technological barriers or trade secrets.

D. Transaction Costs: Information and activities internalized in a vertically integrated firm and included in the price of retail service but which must be separately acquired in an unbundled services market. This includes the costs of information and the processes customers face to exercise choice.

5) Conduct/ Pricing Behavior of Firms: Presence of Tacit or Overt Collusion, Anticompetitive Pricing Strategies.

6) Criteria for Effective Competition

A. Aim for full deregulation only if technology is likely to permit effective competition, with enough room for numerous competitors.

B. Remove regulatory constraints on prices and profits only after effective competition has been established, and not before the leading firm's market share falls below 40 percent and several strong rivals exist.

C. Put competitors on a comparable footing by constraining the dominant firm more tightly than its rivals.

D. Permit entry to explore the viability of competition, but do not rely on potential entry alone to neutralize dominance.

E. Prohibit horizontal mergers that establish dominance or create market shares above 20 percent (research has shown that firms with market shares of less than 10 percent may be able to strategically price and bid to influence market price.)

F. Use profit rates to assess the effectiveness of competition (excess profit suggests market power while subnormal profits may indicate that rival firms are too weak to be effective competitors).

## C. Evaluation of Electric Services= Compatibility with Competition

The Commission was not able to definitively determine which services could be offered in a competitive setting. Public comment was almost unanimous in recommending that further investigation be required. Such investigation will require additional technical and economic analysis that incorporates additional public input and possibly a formal proceeding where an evidentiary record can be established. What follows is a preliminary analysis of services that may technically be unbundled and offered in a competitive setting. The analysis is derived from a review of the literature on unbundling and comments made by interested parties. This will help identify those services that require further analysis.

### I. Generation Services

#### I.1. Generation Capacity and Energy Supply

This category of generation service contains five separate services of which four appear to pass the technical criteria for unbundling. The first two services, (I.1.a and I.1.b) **Generation Capacity** and **Energy Supply**, can be unbundled for both suppliers and customers. In addition, the costs are separable. It is generally assumed that these services are capable of being supplied competitively. Generation Capacity is the instantaneous supply of generation measured in kilowatts. It is the rate at which energy is produced, as opposed to the total amount of energy during a given period. Energy Supply is the total amount of energy produced over a period of time measured in kilowatt-hours.

It is unclear whether such services can pass the economic criteria. The central issue revolves around the definition of the relevant market for these services and whether there are enough actual competitors or potential entrants to insure effective competition. Market power issues must be addressed. Our upcoming report on market power may shed more light on this subject.

**System Black Start Capability** (I.1.c) is the ability of a generating unit or station during a system restoration to go from a shutdown condition to an operating condition and start delivering power without assistance from the electric system. This seldom used service is required for system reliability and must be located within the control area as determined by the system operator. This service cannot be offered to individual customers and thus may not be easily technically unbundled. It is also difficult to determine the cost of providing this service. For these reasons black start capability does not appear to be a viable candidate for competitive provision.

**Back up Supply** (I.1.d) is the provision of generation capacity used to replace an outage of generation or the failure to deliver generation due to an outage of transmission facilities and/or to cover that portion of the customer's load that exceeds its generation. It can be technically separated and theoretically can be supplied from anywhere within the interconnection, although transmission constraints should be considered. This service will need further analysis to determine whether it passes the required economic criteria.

**Load Following** (I.1.e) is the use of generation to meet the hour-to-hour and daily variations in system load. The cost of this service is the opportunity cost associated with the need to commit some of the unit's capacity to follow a particular load shape. This reduces the opportunity of the unit to sell on the open wholesale market. This service generally passes the technical criteria for competitive provision, however the system operator will need ongoing data and communication facilities to be able to control and balance the system. Again, an economic analysis will be required to determine if effective competition exists.

#### I. 2. Generation Services Necessary to Support Transmission Services.

This category contains six generation services that must be procured by a transmission customer. FERC has deemed that some of these must be provided by transmission owners as part of their network services.

**Regulation and Frequency Response** (I.2.a) is the provision of adequate generation response capability to continuously balance supply resources with load and for maintaining scheduled interconnection frequency at sixty cycles per second. The service is much like load following except that it must react to very short term fluctuations in load in order to maintain the required frequency of the transmission system. This service is a capacity service. It

requires frequent changes in output by generators to follow the minute by minute fluctuations in load and can increase cost in a number of ways. The system operator must control the provision of this service because it is much more cost effective to provide this service for the aggregate load than for each load separately. Only the system operator knows what the regulation requirements are for a control area from second to second. Therefore, it is more cost effective to provide the service for the aggregate load than for individual loads. Although utilities understand how the provision of this service imposes costs on them, they have little actual data. Without a good understanding of the costs of providing the service, suppliers will find it difficult to bid on their provision. This service may pass the technical hurdles but separation of costs and other economic criteria may not be met. This does not appear to be a good candidate for competitive procurement.

**Energy Imbalance** (I.2.b) is the energy counterpart to Regulation and Frequency Response service. Energy Imbalance must be provided when a difference occurs between the scheduled and actual energy delivered to a load located within a control area over a single hour. This service can be technically unbundled for suppliers and customers. Its costs include both fuel and capital components and are basically the same as those for energy supply. It could be priced on the hourly spot market price. This is a potentially competitive service.

**Loss Compensation** (I.2.c) compensates for the capacity and energy losses that occur when power is delivered for transmission or distribution customers, or both. This can be technically separated for suppliers and customers. The cost factors for losses are the same as those of energy supply but losses generally increase with increases in load. The nonlinear relationship means that marginal losses are greater than average losses. Theoretically, prices should be based on marginal losses, but such a pricing scheme will result in an over collection of revenues over actual cost. This could be a competitive service.

**Reactive Power and Voltage Control from Generation Sources** (I.2.d) provides reactive power (measured in kilovars) from generation resources to support transmission system operations, including the dynamic ability to continually adjust transmission system voltage in response to system changes. This is basically a reliability function controlled by the system operator. Various devices can be used to control voltages with very different capital and operating costs. FERC elected to separate generation- and transmission-based voltage control with the former being an ancillary service that may be amenable to competitive provision. Transmission-based voltage control is to be part of basic transmission service and charged accordingly. Although generation-based voltage control may technically be a candidate for competitive provisioning, it is unclear whether there are enough generators in a given location to insure a competitive market. Thus it is an uncertain candidate for a competitive service.

**Operating Reserves - Spinning Reserve** (I.2.e) is a reliability service that is required because electricity cannot be stored and there must be a continuous and near-instantaneous balance between production and consumption. Spinning Reserve is the provision of generation capacity synchronized to the system. The capacity used for this service is unloaded, but able to respond immediately to serve load in case of a system outage or a sudden change in scheduled load. It can respond immediately and is fully available within ten minutes. This service has traditionally been provided as part of the bundled product. The amount of this service traditionally is determined by the implicit agreement between utilities and regulators in order to maintain a given level of reliability. This service and its costs can be unbundled. It can be provided by either generators or by customers through automatic load-shedding equipment. The same equipment is used to provide spinning reserves, load following and regulation, and thus may complicate the apportionment of costs to these services. Although spinning reserves must be controlled by the system operator it has the potential to be provided competitively.

**Operating Reserves - Supplemental Reserve** (I.2.f) service is another reliability service. This service is needed to serve load in the event of a system contingency. It is different from Spinning Reserves in that it is not synchronized to the system for immediate response, rather, it is available within a short period of time. It provides generation capacity not necessarily synchronized to the system but capable of serving demand within ten minutes. Certain diesel, combustion turbine and hydro units with emergency start capability fall into this category. The cost for supplemental operating reserves can be separated and is the opportunity costs of holding some generation from the market as priced by the spot market. Loads can provide operating reserves through automatic load shedding devices. This service is amenable to market provision.

## II. Transmission Services

Transmission services are the delivery of electric service from generation sources to the distribution system. These services and their eligibility for competitive provisioning are generally acknowledged to be under FERC jurisdiction. FERC Order 888/888-A requires Transmission Providers to provide two primary types of transmission service: Point-to-Point Transmission Service and Network Integration Transmission Service.

Point-to-Point Transmission Service is used for the transmission of capacity and energy. Under the FERC requirements, the buyer of the service designates 1) the location where the purchased electricity enters the transmission system, 2) the locations where the load that has contracted for the service will accept electricity from the transmission system, and 3) the maximum magnitude of the transaction.

Network Integration Transmission Service allows the customer to integrate, economically dispatch, and regulate its current and planned generation resources to serve its load in a manner comparable to that in which the Transmission Provider utilizes the transmission system to serve Native Load Customers.

FERC generally has jurisdiction over transmission facilities while the state maintains jurisdiction over distribution. In its Order 888, the FERC attempts to make the distinction between transmission and distribution facilities. Although there are benefits to adopting FERC classifications, states have jurisdictional interests that may contradict these classifications. Further study of these issues is needed.

## **II.1 Provision and Maintenance of Wires**

No matter how transmission and distribution are separated, the provision and maintenance of the transmission facilities will be regulated by FERC and most likely will not be provided competitively.

## **II.2 Ancillary Services**

There are three ancillary services which are considered part of transmission services. The FERC considers these necessary for the provision of basic transmission service within every control area. It can only be provided by the system operator. Although potentially competitive, these do not appear to be good candidates for competitive provision although the industrial customers recommend dynamic scheduling for consideration.

**Scheduling, System Control and Dispatch service** (II.2.a) is an ancillary service required for the movement of power through, out of, within, or into a utility's control area. Scheduling, System Control and Dispatch service is provided directly by the control area operator.

**Network-stability Services** (II.2.b) is the maintenance and use of special equipment (e.g., power-system stabilizers and dynamic-braking resistors) to maintain a secure transmission system. It is similar to regulation and frequency response service, in that, it is required to maintain reliability. It is probably not a good candidate to be provided competitively.

**Dynamic Scheduling** (II.2.c) is a service that requires real-time metering, telemetering, and computer software and hardware to electronically transfer some or all of a generator's output or a customer's load from one control area to another. This service is used to enhance reliability but also could be used for commercial purposes. There are differences of opinion on whether this can be technically unbundled and whether its costs can be appropriately apportioned. This service deserves further investigation on whether it can be provided competitively.

## **III. Distribution Service**

Distribution Service delivers electricity from the transmission system to the end user and includes billing and accounting for the delivery. This category can be divided into four sub-categories. The Provision and Maintenance of Wires, Ancillary Services, End-Use Metering, and Customer Accounting.

### **III.1 Provision and Maintenance of Wires**

This portion of the wires service is not amenable to competition. Competitive provision of the actual wires would lead

to the duplication of services and increased costs. It is anticipated that such services will remain under regulation at the state level.

### **III.2 Ancillary Services**

However, there are two distribution ancillary services that may be competitively provided and must be procured by a distribution customer. They include:

**Reactive Supply and Voltage Control** (III.2.a) is a service that provides reactive power from generation or capacitors as required by the physical nature of the distribution system and customer load. Currently, an average acceptable power factor is assumed and, if not met, a charge is assessed for the reactive power in excess of the allowable power factor. It is technically possible to unbundle this service but again it deals with local reliability issues and may not be amenable to competitive provision.

**Loss Compensation - Distribution** (III.2.b) is required to account for the capacity and energy losses that occur when power is delivered through the distribution system. Although it is controlled by the system operator, it may be possible to provide the service competitively.

### **III. 3 End-Use Metering**

This category of distribution services can be unbundled by the supplier and possibly to the customers. However, the REAs and PacifiCorp point out that if competitive provision is to occur it should be between the supplier of metering services and the supplier of electricity, not the ultimate consumer. Independent third party provision of these services directly to the customer may have perverse incentives that would lead to inefficiencies. For instance, the third party provider may have an interest in seeing that loads are not properly metered and thus could lower the bills for its customers.

**Meter Ownership** (III.3.a) is a service that provides the actual physical assets of the meter.

**Operation and Maintenance** (III.3.b) is a service which includes meter installation, testing, calibration and repair.

**Meter Reading** (III.3.c) is a service which includes the reading of meters for the purpose of billing customers. This service also includes performing meter check reads at the request of customers who are concerned that their meter was read wrong.

It may be possible that these services can be obtained in a competitive market, but they are likely not good candidates for customer choice. The choice and the market would be between the supplier of electricity and the provider of end-use metering services. More investigation into the potential for competitive provision of these services is necessary.

### **III.4 Customer Accounting**

**Account Services** (III.4.a) This service establishes and maintains customer deposits/bonds, issues deposit refunds, processes returned checks, and maintains updated refunds, and maintains updated accurate records on call-in privileges, payment agreements and bankruptcies. Record services include maintaining accurate customer records, preparing a timely billing statement, resolving billing disputes, customer inquiries and balancing revenues.

**Customer Information and Data Processing** (III.4.b) is a service that is responsible for all incoming customer calls and walk-ins requesting connection, disconnection, transfer of service, report of service outages and resolving customer problems and development of customer load profiles.

**Billing** (III.4.c) services include the activities that are associated with billing customers for services rendered.

**Payment Collection and Processing** (III.4.d) are services which include the activities that are associated with collecting payment for billed services.

**Uncollectibles** (III.4.e) are the losses associated with past due bills that are recognized to be unrecoverable.

Much like end-use metering, these services are currently being provided by the integrated utility. They may be amenable to competitive provision but only between the supplier and the provider of these services. However, it is important to note that access to customer information obtained through billing, metering, payment collection and processing could give a competitive advantage to the incumbent. Access to such information should be provided to all suppliers.

## **IV. Other Services**

The fourth group of services that may be unbundled include the aggregation and a variety of public interest programs.

### **IV.1 Arranging for Power Supplies**

This supply arrangement category of services contains those services necessary to arrange for generation resources sufficient to meet the demand of the customers served by the aggregator. Arranging for generation, transmission, and distribution services either for direct customer purchase or on a resale basis is included within the function of Supply Arrangement. Aggregators are not regulated by the FERC unless they are also marketers. It appears that this service could be considered as a potentially competitive service. In comments to the Commission, industrial customers recommend that it be declared a separate service so that customers could be protected through licensing requirements to insure that the aggregators have adequate access to capacity and energy.

### **IV.2 Public Goods Services**

Public Goods services include those financial, technical and other services that further public policies on the provision of electric service. Such programs may include: demand-side management programs(IV.2.a), low income assistance programs(IV.2.b), low-cost energy audits for residential customers (IV.2.c), provision of renewable resources(IV.2.d), and protection of the environment (IV.2.e).

In economic theory, a public good is a good or service imbued with particular properties which discourages private supply. Public goods constitute a market failure and requires some intervention. Of the services listed above, low income assistance programs and environmental protection will require government intervention. However, the others have the potential to be competitive services.

## **V. Summary of the Parties= Positions**

In preparation for this report, the Commission asked all parties in Docket No. 96-999-01 (the PSC's earlier informal proceeding) to submit comments to the Commission for its review and consideration in preparing the reports requested by the Legislature in S.B. 67. The Commission asked the parties to:

1. Provide preliminary comments on the relationship between unbundling and restructuring
2. Propose additions or deletions to the list of services, and explain the proposed changes;
3. Identify the best process by which to determine which services can be unbundled,;
4. Provide the economic criteria by which one would evaluate whether the unbundled service is potentially competitive;
5. Given the economic criteria identified, determine which unbundled services could be provided competitively in Utah; and

6. Identify any safeguards required to maintain the competitive provision of these unbundled services.

The Commission received responses from the nine parties noted on page 6. Following is a summary of the responses of each party to the questions asked.

## 1. Preliminary Comments

Almost all respondents suggested that unbundling of electric utility services will be a long and complicated process. A definitive analysis of what to unbundle and how will require more time and effort. Many recommended specific processes, but the general consensus was that more public dialogue and information is needed before decisions are made. Another general theme stressed by respondents is the evolutionary nature of the process which requires frequent monitoring and adjustment to insure the public interest.

The consumer oriented parties, CAP and the Committee, are more sanguine about the prospects for unbundling. In the words of CAP, "the legislative directive puts the cart before the horse". They urge policymakers to determine the costs of providing unbundled services and compare them to the current bundled rates before making the decision to unbundle. Restructuring should take place only if it is clearly in the interests of all citizens of the state. The Committee shared the CAP's concern regarding higher rates, especially for the residential and small commercial classes. The Committee asserts that if restructuring is not in the interests of Utah electricity customers than further study of unbundling is unnecessary. The Committee also is wary of potential cost shifting that may accompany unbundling. If the services cannot be unbundled equitably and efficiently while maintaining reliable and universal service then restructuring and unbundling should not be pursued.

The public providers, i.e., REAs and UAMPS, advise caution. The REAs advocate continued observance of restructuring processes occurring outside of Utah in order to learn from their successes and failures. UAMPS, in a strongly worded conclusion, recommends the State of Utah recognize reality: generation, transmission with appropriate generation related services, and distribution cannot be unbundled until two actions are completed: the creation of an independently operated, and preferably, owned transmission system and an increase in the number of generation suppliers in the local area be increased.

The industrial intervenors, both UEDG and UIEC, are less reticent about unbundling electric services. However, they caution that insuring the competitive provision of these services is a dynamic process that will require the state to continually oversee the process. Noting the work done by the FERC to unbundle transmission services for wholesale competition, the UIEC recommends that the state policymakers follow FERC guidance in defining the services to unbundle. Consistent definitions across jurisdictions will help create a larger regional market with more competitors and lower prices.

PacifiCorp did not preface their recommendations with any precautions except to note that services which are necessary parts of utility distribution or transmission service should not be separately unbundled. Such distinctions would over complicate customer bills and lead to confusion. Services or products on which consumers have no need or opportunity to make discrete purchasing decisions should not be unbundled.

The Division cautions that the issue of market power should be addressed prior to the actual unbundling of services to insure their competitive provision.

## 2. List of Unbundled Services

Before engaging in a detailed study of unbundling issues, both PacifiCorp and the Committee propose as an important first step that services and their costs be separated into their various components: generation, transmission, and distribution. PacifiCorp proposes including billing services and public purpose programs, as well.

Some parties proposed no amendments to the list: the Division, the Committee, PacifiCorp, UEDG, and Enron. Several in that group believe that as more experience and information is developed, or as markets emerge, there may be a need to amend the list of services which could be unbundled.

Only one party, the UIEC, recommends a deletion from the list: Load Following. Similarly, only the UIEC recommends additions, namely: Scheduling, System Control, Dispatch Services, Loss Compensation and Dynamic Scheduling.

### **3. Process for Determining Which Services can be Unbundled**

Several parties (the Division, the Committee, PacifiCorp and, by inference, CAP and Enron) advocate doing this in steps, the first one being the separation and allocation of the costs of generation, distribution and transmission, primarily through the pending rate case. These parties propose, in general, to use a variety of formal and informal processes, in stages, to continue to determine which components could be unbundled, and how they would be priced. These staged proceedings should include, in addition, a formal process before the Commission to restructure the incumbent utility and to address market power issues (according to the Division); formal hearings on issues relating to cost shifting, customer protection, and access (the Committee).

On the other hand, the UEDG would start with identifying potentially competitive services as the starting point to determine what could be unbundled, believing that changing market dynamics preclude a permanent or conclusive determination of whether a service can be unbundled. The UIEC advocates primarily focusing on the process and guidance provided by the FERC to drive a consensus process to allocate costs. This would, it asserts, have the benefit of minimizing jurisdictional conflict.

The UREA cautions that comparison of costs between investor-owned utilities and rural cooperatives and municipal utilities may be different, and thus may require that the Commission mitigate the effects of these differences. UAMPS recommends that before any restructuring is commenced, two steps must be accomplished: (1) there must be an independently owned and operated transmission system; and (2) there must be more generation suppliers in the local area.

### **4. Economic Criteria for Evaluating Whether an Unbundled Service is Potentially Competitive**

All parties in large part agreed with the criteria outlined by the Commission (see section IV. B of this report) at least as a starting point, except that UAMPS provided its own list of questions which it recommends be used as criteria to evaluate potentially competitive services. The Division cautions that current proposed criteria are inadequate without also addressing market power. The Committee would add two criteria: whether the long-run cost of service will decrease, and whether equity in providing service will be enhanced. It also proposes other guiding principles: that no customer class gain at the expense of any other; that no subsidies flow from monopoly services to competitive services; and unbundling be revenue neutral. PacifiCorp believes that the Commission's criteria should not be made final until more information -- particularly the experience in other states -- is available. UIEC proposes using the criteria used by the FERC, believing that the Commission's criteria are a good beginning point but should be re-phrased.

Some of the parties offered for consideration some very general guidelines for whether a service could be provided competitively. These included : whether a service could be physically separated and offered independently; whether the incumbent utility would no longer have the obligation to provide the service; whether separation would not increase costs; and whether quality, safety and reliability could remain uncompromised.

### **5. Which Unbundled Services could be Competitively Provided in Utah?**

Parties were asked to evaluate the list of services using their proposed criteria, and specify which services could be unbundled and competitively provided in light of that criteria. The Division could not provide an answer at this time, believing that further technical and economic analysis is needed. For the most part, although not uniformly, parties who did name specific services advocate further study. The Committee would study for unbundling the four commercial services -- Generation Capacity, Energy Supply, Backup Supply and Load Following -- and Loss Compensation from generation. The Committee suggests that, given appropriate safeguards, end-use metering services and customer accounting services may be appropriate for unbundling. The Committee believes that generation services which provide system reliability ought not be open to competition.

PacifiCorp recommends as a general proposition that services which are part of distribution or transmission should not be unbundled. PacifiCorp also suggests that to some extent the following could be appropriate for unbundling:

Generation Capacity and Energy; Load Following; and end-use metering and customer accounting. Enron believes that Metering, Billing and Information Services could be immediately made competitive.

Specific services advocated by UEDG are, at least: Generation Capacity and Energy Supply Service; Loss Compensation and Dynamic Scheduling Services; Arranging for power supplies; reactive supply and voltage control; loss compensation services; end-use metering and customer accounting services; marketing and sales services; and public goods services. The UIEC at a minimum specifically suggests unbundling Generation Capacity and Energy Supply Service (except for load following); and all of the generation services necessary to support transmission service, proposed by the Commission, but with the additions of scheduling, system control and dispatch service.

In contrast, UREA opposes separating out the electric meter. UAMPS cautions that unbundling will lead to free-riding and other abuses, and recommends that none of the services under the first four categories (Generation Capacity and Energy Supply; Generation Services Necessary to Support Transmission Service; Arranging for Power Supplies) be unbundled at this time.

## **6. Safeguards for maintaining Competitive Provision of Unbundled Services**

The Division recommends that the following safeguards, at a minimum, be adopted:

1. Prohibit the incumbent from providing a competitive service at a market rate unless it there is no horizontal, vertical or locational market power in that service. Until then, it could charge cost-based rates; and
2. Require functional separation of regulated and unregulated services.

The Committee advocates taking great care to protect residential and small-business customers from cost-shifting. UIEC would look at strategies to mitigate the market power of the incumbent, including strong affiliate rules to prohibit cost-subsidization and preclude anticompetitive behavior; an independent system operator for transmission, and specific consumer protection strategies such as licensing some alternative sellers.

## **VI. Conclusions, Suggestions and Options**

There appear to be four options to consider for proceeding with unbundling. First, the legislature could take the findings in this report and attempt to implement them. This option has the advantage of being the most expeditious and will quickly implement unbundling. No party recommends this option. It appears to be flawed. Not enough information has been gathered on technical, economic or cost criteria to have confidence that unbundling services identified in this report is feasible or in the public interest. There has not been enough public input nor has an evidentiary record been established that could support an unbundling decision. To implement unbundling under these circumstances might require reversals and changes of decisions that ultimately could slow the effective implementation of restructuring.

The second option is to initiate an informal study of unbundling which will attempt to find a consensus on how to define and classify unbundled services. Analysis of the potential economic provision of these services could be provided by interested parties. Given the close interrelationship between restructuring and unbundling, the results from an informal process will provide more information on both the feasibility of restructuring the electric utility industry and how best to implement it. This procedure has greater probability of promoting the most efficient outcome for the long-run. This procedure was recommended by several parties and is the one that we recommend.

The third option is to initiate immediately a formal proceeding to decide unbundling issues. This option has the benefit of faster implementation but would require more information from the legislature on how restructuring should occur in Utah. Without such direction, a formal proceeding has the potential to produce unbundled services that are incompatible with the future restructured industry. Unbundling decisions then would need to be revised to be consistent with the new structure of the electric industry. Although it could result in faster implementation, it has a greater probability of expending legislative and regulatory resources in subsequent corrective proceedings.

The fourth option is to blend informal and formal proceedings in stages. This is the option the Commission suggests

once the decision to unbundle is made. The first stage would be an informal process to develop a consensus on definitions and classifications, and identify services that may be technically unbundled. This technical information will help in the determination of options for industry restructuring. The second stage would require a formal proceeding to establish the costs of the services. Costs for each service must be correctly apportioned to prevent cross-subsidization. The prevention of cross subsidization of competitive services by regulated services will lead to more efficient markets and will encourage competitive entry. The third stage in the unbundling process would be to analyze the market structure for the unbundled competitive services and institute rules and guidelines that will promote and sustain effective competition to serve the public interest.

## Bibliography

- [1] Chessler, David, *Determining When Competition is Workable: A Handbook for State Commissions Making Assessments Required by the Telecommunications Act of 1996*,<sup>©</sup>The National Research Institute, NRRI 96-19, July 1996.
- [2] California, *Opinion Ordering Separation of Transmission from Distribution and Requesting Comment on Related Items*,<sup>©</sup>Internet Document,  
[http://www.cpuc.ca.gov/electric\\_restructuring/d9610074.htm](http://www.cpuc.ca.gov/electric_restructuring/d9610074.htm).
- [3] Costello, Kenneth W., *The Next Gordian Knot for State Regulators and Electric Utilities: The Unbundling of retail Services*,<sup>©</sup>*The Electricity Journal*, November 1995, pp.38-47.
- [4] Duann, Daniel J., *Pricing Local Distribution Services in a Competitive Market*,<sup>©</sup>The National Research Institute, NRRI 95-12, December 1995.
- [5] Hirst, Eric and Brendan Kirby, *Creating Competitive markets for Ancillary Services*,<sup>©</sup>Oak Ridge National Laboratory, ORNL/CON-448, October 1997.
- [6] Hirst, Eric and Brendan Kirby, *Unbundling Generation and Transmission Services for Competitive Electricity Markets: Examining Ancillary Services*,<sup>©</sup>The National Regulatory Research Institute, NRRI 98-05, January 1998.
- [7] Hunt, Sally and Graham Shuttleworth, *Unlocking the Grid*,<sup>©</sup>*IEEE Spectrum*, July 1996, pp 20-25.
- [8] Illinois, *Request for Comments: Delivery Services Issues*,<sup>©</sup>Staff of the Illinois Commerce Commission, march 18, 1998.
- [9] Kirby, Brendan, Eric Hirst, and James Vancoevering, *Identification and Definition of Unbundled Electric Generation and Transmission Services*,<sup>©</sup>Oak Ridge National Laboratory, ORNL/CON-415, March 1995.
- [10] Kirby, Brendan and Eric Hirst, *Ancillary Service Details: Dynamic Scheduling*, Oak Ridge National Laboratory, ORNL/CON-438, January 1997.
- [11] Kirby, Brendan and Eric Hirst, *Ancillary Service Details: Operating Reserves*,<sup>©</sup>Oak Ridge National Laboratory, ORNL/CON-

452, November 1997.

[12] Kirby, Brendan and Eric Hirst, *Ancillary Service Details: Voltage Control*, @Oak Ridge National Laboratory, ORNL/CON-453, December 1997.

[13] Maine Public Utilities Commission, *Inquiry Into Rules Governing Bill unbundling*, @Docket No. 97-587, October 31, 1997.

[14] Masiello, Ralph D., *Integrating Metering & Information Systems*, @*Public Utilities Fortnightly*, February 1, 1998, pp. 38-43.

[15] Massachusetts, *Investigation by the DPU: Proposed Rulemaking Schedule*, @D.P.U. 96-100.

[16] Minnesota, *Unbundling Electric Utility Rates and Services*, @Report of the Subcommittee on Unbundling, Minnesota Public Utilities Commission Electric Competition Work Group, October 1997.

[17] Morse, Susan Stratton, Meg Meal, and Melissa Lavinson, *Rate Unbundling: Are We There Yet?*, @*Public Utilities Fortnightly*, February 15, 1996, pp. 30-35.

[18] Nevada, *In Re Investigation of Issues to be Considered as a Result of Restructuring of Electric Industry*, @Public Utilities Commission of Nevada, Docket No. 97-8001, October 30, 1997.

[19] Pleat, George R., *Should Metering Stay at the Stand-Alone Disco?*, @*Public Utilities Fortnightly*, February 1, 1998, pp. 44-48.

[20] Rosenberg, Robert G., *Unbundling Capital Costs: It Doesn't Add Up*, @*Public Utilities Fortnightly*, November 1, 1997, pp. 46-49.

[21] Shepherd, William G., *Converting Dominance to Competition: Criteria for Effective Deregulation*, @in *New Regulatory and Management Strategies in a Changing Market Environment*, MSU Public Utilities Papers, Michigan State University, 1987, pp. 22-45.

[22] Valle, Anna P. Della, *Separating Transmission From Generation: What's Required and Why*, @*The Electricity Journal*, March 1997, pp. 83-90.

[23] Wagner, David P., *Letting Go of Electric Generation*, @*Public Utilities Fortnightly*, February 15, 1995, pp. 33-35.