# Universal Access and Its Asymmetries

## The Untold Story of the Last 200 Years

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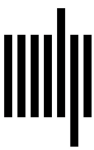

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# ELECTRIFICATION

"The best lighted and heated city in the country." This was the claim of an 1892 pamphlet promoting Muncie, Indiana—a city of such a typical character that social scientists referred to it by the generic name "Middletown." In this manner, the electrification of Muncie and its hinterland, as the historian David Nye (1990) describes, also embodies the story of electrification across America.

On March 31, 1880, with the lighting of four arc lights on the courthouse, Wabash, in north central Indiana, said it was the "first electrically lighted city"—a claim that an Indiana Historical Bureau site marker carries to this day. This event, witnessed by 10,000 visitors and correspondents of over forty newspapers, brought the world's attention to Wabash. The citizens of Muncie, piqued about being overshadowed by a smaller Indiana town, installed 100 arc lights in 1892. In 1894, with 132 such lights in town, *Muncie Morning News* crowed that "there is not a better city electric lighting plant in the state" (Nye 1990, 6). In 1885, James Boyce, a wealthy businessman, illuminated shops with electric lights in his downtown buildings, attracting crowds (Kemper 1908). In 1888, the city council granted its first license for a trolley system, which grew into an interurban network connecting nearby communities, with Muncie in the center (Nye 1990).

Clearly, Muncie accomplished much within a decade, but the process was fitful, with many ups and downs. To start with, since gas was readily

and cheaply available in Indiana, most enterprises preferred the continued use of gas, switching to electricity only after the gas fields petered out at the turn of the century (1901–1907). In the case of residential use, the uptake was much slower—only twenty-two homes had electricity in 1899. However, by 1926, 95 percent of homes had electricity. Muncie's metamorphosis into a sparkling urban center sharpened the contrast with its still dark rural hinterland[1] (Nye 1990), literally and also metaphorically—with electricity representing progress (Lieberman 2017; Marvin 1988). Despite the contrast, the Indiana General Service, deeming rural service to be uneconomical, was unresponsive to requests for it. It would offer service only if rural customers guaranteed five years of usage, amounting to 18 percent of the build-out cost. Few rural customers could afford to do so. Consequently, by 1931, of all the utility's customers, only 4 percent were in rural areas (Nye 1990).

In effect, after electrifying streets, commercial establishments, trolley systems, factories, and residences in urban areas, the utilities were reluctant to undertake the last stage—rural electrification—which was essential for universal access. This shortfall did not sit well with President Franklin D. Roosevelt's administration, creating tension with the utilities. In effect, the development of electrification was marked by the conflicting logics of the utilities and the proponents of rural electrification, as well as by blind spots in their logics, as we will see in this chapter.

## EXPANSION OF ELECTRIFICATION

Electrification started with hyperlocal endeavors, such as factories installing dedicated generators for their own use. In 1882, Edison Illuminating Company established the world's first central power plant, Pearl Street Station in New York, with the goal of supplying electricity in a service area of one square mile (Hughes 1983; Rudolph and Ridley 1986).[2] Upon commencing service, Edison offered it for free, seeking to understand the distribution and use of electricity before entering into contracts with customers.[3] A month later, he had 59 "customers;" three months later, he began charging, and a year later he had 513 customers (Hughes 1983; Munson 1985; New York Edison Company 1913). Thereafter, Edison and others started establishing central power stations in other parts of the

country. The next proof of concept for centralized power generation was the Niagara project, which in 1895 demonstrated the viability of generating power at scale in one place and then distributing it over long-distance transmission lines (Meinig 2004). Subsequently, in an incremental, bottom-up, and contested process, power generation and distribution companies connected their plants and distributions lines into regional grids (Bakke 2016; Cohn 2017).

The expansion of electrification was marked by what Hughes calls reverse salient and momentum.[4] Hughes borrowed the term "reverse salient" from military historians, who use it to refer to parts of an advancing army that fail to keep up, attracting the attention of the top brass, who then direct resources to beef them up. Hughes (1983) found the metaphor "appropriate because an advancing military front exhibits many of the irregularities and unpredictable qualities of an evolving technological system" (14). In the case of technological systems, reverse salients arise because of the imbalances in the capacities of various system components. The resulting suboptimality attracts institutional attention and resources for technological breakthroughs that advance the capabilities of the lagging components. The removal of a reverse salient allows further system growth, which in turn increases complexity and gives rise to a new reverse salient.

While reverse salients are markers of system growth, "momentum" refers to direction and pace of the growth. As a technological system grows, institutions and individuals become invested in its growth: corporate and noncorporate owners and operators of the system, regulatory agencies overseeing them, education establishments producing skilled workers for them, and workers trained in accordance with system needs. Drawing on the experience with polyphase electric systems, Hughes (1983) observes that "the systematic interaction of men, ideas, and institutions, both technical and nontechnical, led to the development of a supersystem—a sociotechnical one–with mass movement and direction. An apt metaphor for this movement is 'momentum'" (140). The bigger point is that once interests are aligned in a certain way, it is difficult to change the direction of system growth.

In this fashion, Hughes provides a detailed account of reverse salients and systemic momentum as the system grew from Edison's Pearl Street

Station to regional grids. These details are not important for our analytic exercise here. We need to note the nature of systemic expansion: between 1915 and 1932, system expansion broadened residential service from 20 to 70 percent of Americans nationally, but only 10 percent lived in rural areas (Meinig 2004). From this point on, system expansion was a product of public policy intervention, *not* momentum.

## INEQUITIES AND INEQUITIES THAT MATTER

In the utilities' view, the cost of constructing rural lines was prohibitive. Their thinking centered on the notion that each line should pay for itself (Reed 1935; Stauter 1973). On the demand side, in their estimation only dairy, irrigation, and a few energy-intensive types of farming could be served profitably (Meinig 2004).[5] In this view, the conundrum was as follows:

> Cost was the real stumbling block to service. Rural lines cost $2,000 or more per mile, and since there were usually only two to five dwellings per mile in the country, utilities anticipated low revenue to amortize investments. . . . Companies expected farmers, therefore, to bear the burden of the initial investment charging them with the cost of the line, or a $500 to $1,000 deposit. Rural rates were also high, about 9 to 10 cents per kilowatt-hour for the minimum usage. . . . Few rural homes could afford to pay for the lines or make the deposit, nor could they at first afford enough appliances to use the amount of electricity necessary to achieve the advantage of lower rates. The effect was an endless cycle of expense for both parties—recipients of service used little power because of high rates, and the utilities charged such rates because of low usage. (Brown 1980, 5)

In effect, rural electrification was taken to be an irresolvable chicken-and-egg problem: reduction in costs would require increase in demand, which would generate economies of scale, while increase in demand would require reduction in costs, which would make the service affordable.

In sum, while the utilities accepted that provision of electricity in rural areas would greatly enhance the quality of life, they could not see how it could be an economically viable proposition. In their thinking, "electric distribution was what it had to be and little could be done about it" (*Electrical World* 1935, 56).

To those invested in the human side of things, this was an inequity that mattered so much that it trumped pure economic considerations. They found the drudgery of rural life unacceptable when labor-saving technology

was available (Childs 1974; McCraw 1971). A statement from Murray Lincoln, secretary of the Ohio Farm Bureau, was particularly compelling: "Why should we sentence men and women to do by the sweat of their brows what electricity can do so much easier and cheaper? After all, human beings ought to be of more importance than returns on utility stocks" (*Rural Electrification News* 1936b, 28). The National Electric Light Association estimated in 1912 that every year, on average, farm wives were spending twenty more days washing clothes than their urban peers with electric washers. Further, they had to use sad irons[6] to press the clothes (Brown 1980). In this fashion, the sad iron became an evocative metaphor and a rallying cry, as "sad" comes from "sæd" (meaning "sated, weary" and also "weighty, dense")[7] in Old English, and also carried connotations that resonated with their cause.

By the 1930s, the notion that electric service is a basic human need had struck deep roots. In 1932, in a campaign speech for the presidency, Franklin D. Roosevelt, then the governor of New York, declared that "electricity is no longer a luxury—it is a definite necessity . . . It can indeed relieve the drudgery of the housewife and lift the great burden off the shoulders of the hardworking farmer" (Roosevelt 1932, 13).

Moved by quality-of-life considerations, the champions of rural electrification directed their energy at finding ways to cut through the chicken-and-egg problem, as opposed to walking away from it. On the economics plane, their goal was not profit per se, but rather an economically sustainable model that eased the burdens of rural life. Their determination and talents brought about much-needed breakthroughs—conceptual and technical. Morris Cooke, the great champion of rural electrification,[8] believed that there was always a "practical way to get done what needs to be done" (Childs 1974, 47).

In this way, champions of rural electrification started focusing on distribution. They argued that the utilities focused on generation and transmission—parts of the network of greatest economic import—and neglected distribution, which was of particular significance for rural electrification. As a starting point, they examined the economics of distribution, where they found the available data to be illegible from the standpoint of cost accounting (*Rural Electrification News* 1935a). Moreover, they noticed significant disparities in cost accounting practices across

companies, which suggested that something was fundamentally wrong. In particular, the existing cost accounting systems no longer seemed valid, as technological advancements had changed the cost parameters and patterns of demand (Childs 1974).

## PROPOSAL FOR AREA COVERAGE

The proponents saw two fundamental flaws in experts' conception of rural electrification: (1) the notion that it entailed the extension of long lines from urban systems into rural areas, and (2) the assumption that the rural households would have only limited use for the service extended to them.[9] In response to the former argument, they said that rural electricity should be seen as a system on its own, not as a mere appendage of the urban system. They called for "area coverage" (the electrification of swaths of land in an integrated manner, as opposed to the extension of isolated lines from urban systems), arguing that the resulting economies of scale would bring down the costs dramatically below the utilities' per-line calculations (Burritt 1931; Stauter 1973). As for the second concern, they scoffed at the notion that rural households would use only a sixty-watt light bulb's worth of electricity, pointing out that as places of both residence and work, they were likely to have even greater usage than urban locales (Stauter 1973). Furthermore, they noted that after securing electricity, rural households tended to purchase appliances, which significantly increased their electricity usage (Brown 1980).

This new thinking gave rise to the Rural Electrification Administration (REA), established by President Roosevelt in 1935 under the authority of the Emergency Relief Appropriation Act of 1935.[10] Upon its establishment, REA sought to develop a partnership with electric utilities to implement its program. It was only when these efforts failed that it turned to rural cooperatives (Christie 1983).

REA channeled the American self-help ethos, in marked contrast to other countries where governments themselves constructed rural networks. This was remarkable, given that only 11 percent of American farms were electrified in 1935 and the corresponding figures were much higher in other countries: 95 percent in the Netherlands, 90 percent in France and Germany, and 80 percent in Denmark (Coyle 1936; Nye

1990). Many groups called for direct government intervention to catch up with other industrialized countries (Childs 1974; Slattery 1940). Yet the REA embarked on a bottom-up strategy.

REA provided subsidized loans—with softer interest rates,[11] payment periods, and collateral requirements—to rural cooperatives for building, maintaining, and operating their own distribution systems. With these self-liquidating loans, REA worked to establish eventually self-sustaining electricity cooperatives—a venture in social entrepreneurship that its third administrator, Harry Slattery, characterized as a "business like any private enterprise" (Slattery 1940, 6). In effect, REA saw itself as an incubator of projects rather than a source for permanent subsidy. In addition to loans, REA provided technical guidance to the cooperatives. As Cooke (1935) explained: "It is always well to remember that the REA can only give a *start* to the vast undertaking of electrifying rural America along progressive lines. But if it can give impetus to new policies and sound technique, I am confident the movement will go forward on its own momentum" (4, italics in original).

REA's area coverage approach generated economies of scale, which brought down the construction costs. Moreover, Cooke directed that "rural lines need not be built for the ages" (Christie 1983, 174). Accordingly, REA developed steel-reinforced poles without cross arms to lower maintenance costs, doubled the cables' span length to reduce the number of poles, and designed sturdy meters and other devices for rural conditions (McCrary 1939; Rural Electrification Administration 1938).

For their part, farmers contributed their labor, and their cooperation brought down the cost of rights-of-way (Burritt 1931) and many other things. For example:

> Some time ago a few of the systems in the sparsely settled areas found that the cost of meter reading and billing was one of the large items in the final cost of electricity. Someone suggested that each member read his own meter and mail the reading to the office. This was tried with success and reduced the reading and billing costs from an average of 25 cents to as low as 5 cents. (*Rural Electrification News* 1939a, 21)

With such innovations and community inputs, REA brought down the construction costs from $1,500–1,800 per mile to about $900 per mile (Christie 1983).

In addition to building networks, REA worked to "build up the psychology of generous use of electricity" (Morris Cooke, quoted in Christie 1983, 177). To do so, it focused on lowering rates, believing that this would increase usage and foster innovations (Christie 1983; Stauter 1973).[12] To enable individual access and build up demand, REA also provided loans to rural households for inside wiring and appliances (*Rural Electrification News*. 1935b). Furthermore, it helped manufacturers develop simple and less expensive appliances for rural markets (Christie 1983).[13]

Area coverage also forestalled capacity suboptimization, which tends to plague the development of rural electricity and other networks. Often, initial estimates underestimate demand, and, consequently, the built network turns out to be inadequate in the face of actual demand. As Smith (1931) notes, "Experience mindfully reminds us, it should always be kept in mind that the developments may surpass the ultimate assumed" (816). By plunging straight into the development of the overall system, REA's area coverage approach prevented this problem.[14] Subsequently, the rural cooperatives went on to prove the utilities wrong on both counts—construction cost and demand. But that is another story. Here, we need to focus on the gains and travails of rural electrification—both expected and realized.

## GAINS AND TRAVAILS

Both the proponents and the utilities saw gains from rural electrification. The disagreement was primarily on the economics, with the utilities emphasizing the costs. As we take stock of the gains and travails (see table 4.1), we see that the reality was much more complex.

### INDIVIDUAL

**Gains** Rural electrification improved the quality of life of country dwellers—at least as we moderns understand it. They gained two to four waking hours and creature comforts such as refrigeration. Also, local industrial activity increased, at least initially (Brown 1970). Moreover, they developed innovative uses of electricity.[15] For instance, N. G. Norris, the owner of a large frog farm, facing high feed costs because frogs do not eat anything dead, found an innovative way of cutting his expenses.

**Table 4.1** Rural electrification: Gains and travails

| | Gains | Travails |
|---|---|---|
| Individual | Improved quality of life<br>Increased productivity on farms | Increased productivity on farms, reducing the need for labor, prompting more migration to urban areas |
| System | Utilities supplying wholesale power to rural electricity cooperatives<br>Electrical appliances manufactures profiting from the expansion of markets for their products | Tumult generated by strenuous and sustained political pushback by those opposed to government's involvement in electrification |

In Norris's telling: "We put unusually bright electric lights at various places close to the surface of the ponds. These lights attract hundreds of thousands of insects at night. The frogs gather beneath the lights, stand on their hind legs and eat their fill" (*Rural Electrification News* 1936a, 25). Another farmer used an electric washing machine to shell peas (*Rural Electrification News* 1939b). More broadly, electrification helped dairies, vegetable and fruit processing plants, canneries, grinding mills, cotton gins, grain elevators, sawmills and lumberyards, nurseries, stockyards and slaughterhouses, game and fur farms, planing mills, and machine shops (Slattery 1940). By the 1950s, the extensive use of electricity in rural areas belied the apprehensions of the utilities.

After a sweeping overview of the facets of rural life touched by electricity, we need to gain a sense of the depth of change as well. To do so, for the purposes of this discussion, we will delve into one change at some depth—running water made possible by electrification. In 1919, the US Department of Agriculture (USDA) reported that rural families spent over ten hours per week pumping water and carrying it to their kitchens (Brown 1980). Running water not only eliminated such laborious chores, it also greatly improved sanitation and public health (Cooper 1940). According to one report, after the availability of running water, a rural school saw a 350 percent increase in handwashing soap use (Radder 1939).

**Travails** While the proponents succeeded with their average coverage approach, multiple-purpose thinking, and building up of the "psychology of the generous use of electricity" (assisted by low rates and loans

for appliances), they had their blind spots (Christie 1983). In particular, they expected electrification to improve the quality of rural life on the one hand, and strengthen the rural economy on the other, and thereby stanch the loss of rural population[16] and even generate a back-to-the-farm movement (Carmody 1939; Deutsch 1944; Erdman 1930; Lilienthal 1939; Slattery 1940; Stauter 1973).

The hope that electricity would decentralize industry was not limited to rural communities. Many people across the world, including in urban areas, harbored this hope. For instance, in France, Alglave and Boulard (1884) felt that in the preelectricity era, societies concentrated industry and bore the travails of densely packed and polluted cities because the economics of small, coal-fired engines were prohibitive. "Electricity, on the other hand, does not suffer the same losses in being divided so as to be put at the disposition of the humblest" (Alglave and Boulard 1884, vi–vii). Therefore, with this new source of energy, the disadvantage of small producers vis-à-vis big producers would be greatly mitigated, allowing for a new flourishing of small producers. In rural America, this hope was expressed as follows:

> The effect of good roads and automobiles has been to centralize many kinds of industry in the towns surrounding the great cities. Goods that used to be made on the farm are now made in town and bought for cash by the farmer. With electric equipment of his own, the farmer can bring back some of these profitable activities to his own house and barn, saving himself trips to towns as well as money. With his own feed-grinding mill, his own refrigerator, his own fertilizer mixer, the farmer can often process his own materials for his own use, saving transportation and expense. The farmer's wife, with suitable electric equipment, will find that canning and preserving can be done with far less labor and discomfort than under the old methods. (Cole 1936, 16)

With such value-adding activities on the farm, the farmer was expected to move up the value chain and earn more on the one hand, and reduce damage and wastage of the produce in storage and en route to the market on the other (Childs 1974). Looking beyond agriculture,[17] the proponents hoped to entice industries to relocate to rural areas, with their lower rents and labor costs (Mosher and Crawford 1932; Slattery 1940).

With these quality-of-life and economic enhancements, Morris Cooke saw a "cultural renaissance" in the making, a revitalizing force for the

nation, amid fear that decay of the heartland would led to a "historic slide" downward (Christie 1983; *Rural Electrification News* 1936a; Stauter 1973).[18] Electrification did indeed improve the quality of life in rural areas, and it also helped greatly increase agricultural productivity. But Stauter (1973) asks, "Was it 'cultural renaissance' or just another step in seemingly inevitable homogenization of American life? Farm life lost much of its drudgery, to be sure, but it also lost some of its distinctiveness and character" (274). Moreover, the reduction in the need for labor, with dramatic increases in productivity and increased integration with urban areas, enabled more people to leave the farm. Consequently, electricity, instead of retaining the rural population, contributed significantly to increased migration to urban areas (Stauter 1973).

In sum, what eventually transpired was at odds with what was envisioned. Consider the prediction of the governor of Pennsylvania, Gifford Pinchot, a champion of rural electrification: "Long distance electrical transmission is to be the basis of the new economic and social order" (Christie 1983, 73). None of that came to pass—reality did not accord with what Carey and Quirk (1970, 423) call expectations of "electronic sublime."

## SYSTEM

**Gains** Urban power plants also gained from electrification, despite their resistance. In the late 1930s, REA-assisted projects made about 67 percent of their total wholesale power purchases from private utilities. In the next decade, 1940–1950, their annual purchases from utilities increased twentyfold, from $2.5 million to $50 million (Wickard 1950). Also, manufacturers of electrical appliances profited from the expansion of their markets to rural areas. Poor's Industry and Investment Surveys reported:

> The electric washing machine industry's unit sales volume will top that of 1935 by close to 30 percent. Sale of ironers will also establish a new peak. The demand for household electric refrigerators continued strong. For 9 months of 1936, sales showed a gain of approximately 30 percent over the corresponding 1935 period. Radio sales continue upward. (*Rural Electrification News* 1937, 3)

Rural electrification not only created an immediate market for electrical equipment, but it also created future markets by increasing farm income

(Dieken 1936). As Childs (1974) put it: "It was a golden market, a bonanza, that beckoned private enterprise" (81).

It is conceivable that REA could have developed its own generation capacity. It even threatened to do so. But that would have increased the complexity and cost of rural electrification. In actuality, the wholesale supply of the electricity by utilities to rural cooperatives was mutually beneficial (Zinder 1936).

**Travails** In the light of the success of New Deal policies and programs, it is easy to overlook the political opposition they had aroused in the beginning. In the case of REA, the opposition was extraordinarily fierce because it helped create potential competitors to private enterprise—namely, utilities. The time and resources that the different stakeholders and their allies devoted to the political struggle resulted in an opportunity cost for the political system, if nothing else.

## NEW CONCEPTIONS FROM THE MARGIN

We have much to learn from the arguments advanced by the proponents of rural electrification—both in terms of what to emulate and what to avoid. They had two sets of arguments: (1) reasons why utilities were wrong about the costs of rural electrification, and (2) reasons why rural electrification would benefit rural areas.

### COSTS OF RURAL ELECTRIFICATION

The utilities' skepticism about the economics of rural electrification was anchored on two considerations:

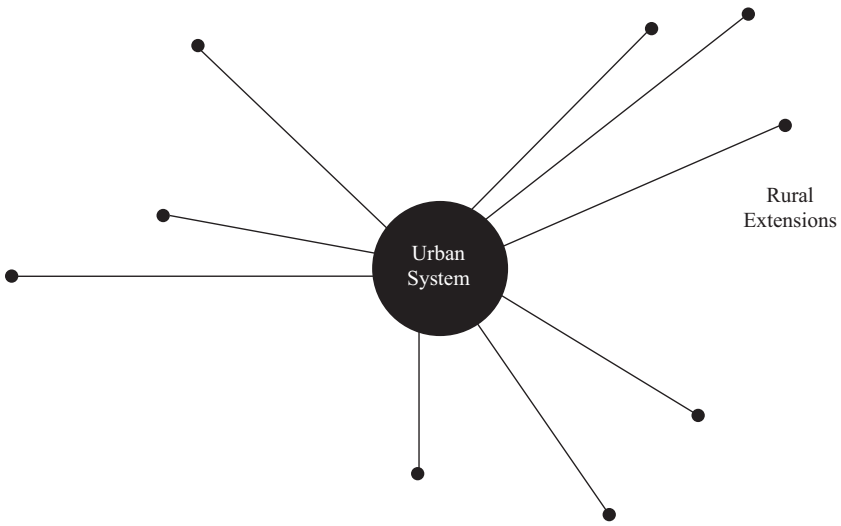
1. Cost of constructing rural lines was very high.
2. The potential demand was too low.

In effect, from their standpoint, the math did not add up. The proponents thus countered the utilities' arguments as follows:

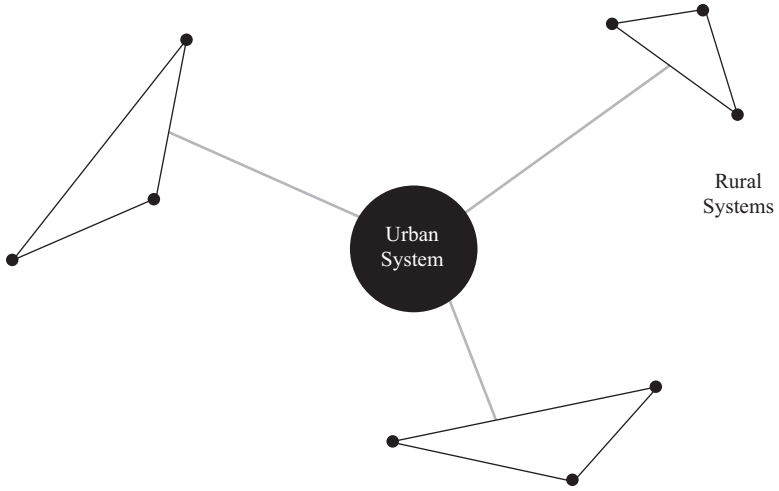
1. The utilities' cost estimates were based on the principle that each rural line should pay for itself, which is deeply flawed.
2. The utilities' estimates of potential demand were based on the assumption that rural households would use electricity for a "sixty-watt bulb"

(i.e., a handful of applications) for only a few hours a day, which reflected a limited understanding of the mix of domestic activities and working in rural life.

On the first argument, they went on to undertake recentering-on-reversal, pointing out that the notion that each rural line should pay for itself was a product of a linear conception of the rural network as an extension of the urban system. Herein, the former was reduced to an appendage of the latter (figure 4.1). The linearity of this conception, which in modernity has a ready hold on our minds, obscures other possible linking relationships between adjoining areas. The proponents decentered the urban areas and center-staged the earlier marginalized rural communities.[19] In this changed mindscape, lateral connections *among* rural communities gained salience.[20] Correspondingly, they developed the area coverage approach, wherein the urban-rural relationship is conceptualized very differently—the rural network as a complement of the urban system (figure 4.2). What is truly remarkable here is that the proponents not only undertook recentering-on-reversal on the conceptual plane, but they also demonstrated its power on the ground by building out successful rural electricity networks in accordance with the area coverage approach. Appropriately, upon proving the expert opinion wrong, Cooke




**4.1** Utilities' view of rural electrification: Appendage of urban system.




**4.2** Proponents' view of rural electrification: Complement to urban system.

noted that REA-assisted cooperatives brought about "rural electrification in spite of the expert" (quoted in Christie 1983, 184).

On the second argument, rural dwellers from the outset started using electricity in myriad, often innovative, ways. The proponents, for their part, proactively worked to facilitate use and build up demand. For instance, REA provided loans for inside wiring and appliances, held demonstrations of electric machinery and appliances, and engaged in outreach activities. With the success of rural cooperatives, they showed that utilities, viewing rural demand through the urban lens, failed to realize that a rural household is not only a place of residence, but also a place of production.[21] In the words of John Carmody, who succeeded Cooke as the head of REA, the utilities "couldn't see the rural market."[22]

## BENEFITS OF RURAL ELECTRIFICATION

The proponents sought to stem the depopulation of rural areas. To that end, they saw two broad benefits of rural electrification:

1. Enhancement of rural quality of life
2. Enhancement of rural economies

These enhancements, in their view, would reduce rural-urban disparity.

Electrification did enhance the quality of rural life—a point we need not belabor here. But that alone could not stanch outmigration to urban areas.

Proponents' expectations were thwarted by problems in the arena of economics, which they did not anticipate. Broadly, they were twofold:

1. Electricity did reduce drudgery and increase the efficiency of the farm operations, as they had anticipated. But then it also greatly reduced the need for labor, which they had not considered.
2. Electricity did enable urban enterprises to relocate operations in rural areas, as they had anticipated. But the economic decentralization that occurred paled in comparison to the other changes enabled by electrification, which they had not considered.

The proponents of rural electrification got blindsided because of their rural-centered view of electricity. Black (1962) explains how a metaphor can organize our view of a multidimensional object of interest:

> Suppose I look at the night sky through a piece of heavily smoked glass on which certain lines have been left clear. Then I shall see only the stars that can be made to lie on the lines previously prepared upon the screen, and the stars I do see will be seen as organized by the screen's structure (41).

Translating Black into our domain of interest, the problems of rural areas are the clear lines, which organized the proponents' view of electricity. They saw in electricity the potential for solving rural problems. They were correct, as electricity could indeed help enhance the quality of rural life and enable decentralization.[23] But they were correct in only a small way. Their rural-centric view obscured the bigger reality: electricity is a protean technology that enables myriad things. Correspondingly, it is polysemous—different people take it to mean different things (Lieberman 2017).

The proponents' rural-centered view was severely constrained, centered as it was on what country dwellers would do with electricity. For instance, Slattery (1940) waxed enthusiastic about its decentralizing potential: "Rural area electrification and high-voltage transmission have put the equivalent of a large or small steam or gas engine at the command of the farmer" (96).[24] This view is centered on the "engine at the command of the farmer." It is a nodal view, focusing on nodes of the system. If we employ the analytical strategy of recentering-on-reversal and decenter the "engine at the command of the farmer," we can easily see what the

rural-centric view of rural electrification obscured—"high-voltage transmission." Now, if we center-stage "high-voltage transmission," we have the relational view, which focuses on connections between the nodes, allowing us to see what actually transpired.[25]

Electrification integrated rural areas into more tightly with the metropolitan economy. While electrification enabled the proponents to implement their envisioned solutions for rural areas, it did not stem depopulation. On the contrary, quite the opposite happened. Proponents had failed to consider that in the larger arena of integrated metropolitan economy, their own efforts to shore up rural areas would be dwarfed by other forces at play. They were limited to a localized view, one too optimistically biased toward local solutions, when they needed a global network view, with its attendant implications—both positive and negative.

Looking back, the process would have been better served if the rural-centered view of the proponents also had been subjected to recentering-on-reversal, as doing so would have expanded the discussion in the direction of what eventually transpired. The utilities would have been prime candidates for undertaking such an exercise.

Since the utilities failed to rise to that level, our analysis suggests that the proponents would have been better off if they had performed recentering-on-reversal on their own rural-centered view. Doing that would have expanded the range of their thinking to possibilities that were counter to their hopes and intuitions. But that would be asking too much of underdogs engaged in a tough battle with much more powerful adversaries, when the general sentiment, including those of sophisticated observers of technology, celebrated electricity, including centralized power generation and long-distance transmission (Lieberman 2017). This, however, is not inconceivable because for its proponents, electrification was only a vehicle for their larger goal—the betterment of rural areas. To forestall such slippage, perhaps recentering-on-reversal should be part of the standard procedure employed for policy formulation.

We happen to be ending with a rather tough critique of the proponents of rural electrification. As a matter of fact, they actually did pretty well. They subjected utilities' urban-centric view to recentering-on-reversal, and, moreover, they went on to construct self-sustaining electricity networks, improving the quality of rural life. The question with regard to

performance of recentering-on-reversal on proponents' own view arises because they lost on the bigger front—electrification facilitated further depopulation of rural areas as opposed to stemming it. But then, this is a coldly analytical exercise.

We often find ourselves taking a tough view of social compacts we cherish. The analytical strategy of recentering-on-reversal makes us think of things that we were committed to in new ways. In the case of proponents of rural electrification, recentering-on-reversal on their position might have served them well, giving them an opportunity to formulate interventions to forestall and mitigate movements in undesirable directions that they failed to anticipate.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