Section 4: How Might We Think About Smart Infrastructure Corridors?

4.1: Background

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“Infrastructure: The basic facilities – such as transportation and communications systems, utilities, and public institutions – needed for the functioning of a community or society.”

– U.S. Department of Transportation, Eco-Logical: An Ecosystem Approach to Developing Infrastructure Projects

Spurred by the threat of climate change, continuing technological advances, an aging existing infrastructure, and global competition for goods and services from emerging economies such as China and India, the United States is in the midst of determining and implementing a national campaign to improve its transportation and energy infrastructure. Realizing this goal will entail development on a nation-wide scale and will certainly impact efforts to protect and conserve open space. New energy transmission lines, natural gas pipelines, and, of course, roads will be sited and built. Determining exactly how this development will take place, however, is an ongoing process. Conservation organizations can and should play a role in the development of a national strategy for smart infrastructure development. Only by doing so can they determine how that strategy plays out on the ground in specific regions.

This paper provides an overview of the basics of infrastructure corridor development. It also highlights illustrative case studies, offers some questions to consider and suggests resources that provide more in-depth information on these topics.

Traditional Development Models

Electricity Transmission

A principle element of any power generation project is determining how to deliver the newly created electricity to end-users. Transmission lines help to serve this purpose by connecting generators to distribution networks. As new generation facilities come on-line, or as existing lines become congested, the construction of new transmission lines is often necessary. Siting
new generation facilities near existing infrastructure lowers capital financing requirements and improves transmission efficiency; as transmission line length increases, energy lost as a result of electrical resistance increases as well (Molburg, 2007).

Building new transmission lines presents several challenges. One set of challenges stems from the fact that many of the best sites for renewable energy production are located far from existing energy transmission systems and even farther from end users. The cost of building new transmission infrastructure can be a prohibitive factor when considering the development of new wind or solar projects.

**U.S. Transmission Grid**

![United States transmission grid](image)

*Source: Federal Emergency Management Agency.*

**The North American Transmission Grid**

The North American grid includes power generation, storage, transmission, and distribution facilities in Canada, the United States, and northern Mexico (Baja Norte). There are three continental interconnects: (1) the Western Interconnect, which operates west of the Rocky Mountains; (2) the Eastern Interconnect, which operates east of the Rocky Mountains; and (3) the Electric Reliability Council of Texas (ERCOT), which operates predominantly within the state of Texas. Within each interconnection, all electric utilities are interconnected and operate synchronously; that is, the generators are operated such that the peak voltage from all generators occurs simultaneously. The three interconnections are linked via several high voltage direct current (DC) transmission lines. DC is used to avoid the need for synchronicity between utilities operating in different interconnects (Molburg, 2007).
A second challenge is the actual siting of the additional transmission lines. New lines require access to new land, raising all the normal suite of environmental concerns related to open space development. As such, many conservation organizations have traditionally opposed transmission line development. This deepens the tension in the wider environmental community between those working to develop cleaner, domestic sources of energy and those seeking to protect natural areas. But support for renewables is not the issue – rather it is the question of how to navigate the fact that virtually any energy production – fossil or renewable – produces impacts that are seen as counterproductive to conservation goals.

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**The Federal Energy Regulatory Commission (FERC) and Transmission Line Siting**

FERC has broad authority over the permitting of new interstate transmission lines. It also oversees electricity sales, wholesale electric rates, hydroelectric licensing, natural gas pricing, and oil pipeline rates. Additionally, FERC reviews and authorizes liquefied natural gas (LNG) terminals, interstate natural gas pipelines and non-federal hydro-power projects.

Transmission line developers work with FERC on the permitting and siting process, though FERC does not mandate any specific route. The developer determines the route piece by piece in conjunction with private and public landowners and with suggestions from FERC and other entities (including conservation organizations).

Once the project has been approved by FERC the developer begins to negotiate right-of-way easements and appropriate compensation for those easements with each landowner affected by the transmission route. If an agreement cannot be reached between the developer and a landowner, the developer has the right to exercise eminent domain (under section 216(e) of the FPA and the procedures set forth under the Federal Rules of Civil Procedure (Rule 71A)). Under these conditions, the landowner would receive compensation as determined by the courts. The developer does not have the right to exercise eminent domain over state or federal lands.

For more information see: www.ferc.gov.

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A third concern for conservationists is the possibility of federal preemption of transmission line siting authority. With frequent stalemates on such siting questions at the state and local levels, the discussion of more federal intervention has intensified. Should that occur (see box on page 58), the concern is that the opportunity for local conservation interests to be heard may be diminished.
U.S. Department of Energy National Interest Electric Transmission Corridor Designations

In 2007, the U.S. Department of Energy (DOE) issued the National Interest Electric Transmission Corridor (NIETC) Report and the Ordered National Corridor Designations. These designations came on the heels of an earlier National Electric Transmission Congestion Report, which was authorized by 2005’s National Energy Policy Act (NEPACT).

In the words of the DOE: “The National Corridor designation serves to spotlight the congestion or constraint problems adversely affecting consumers in the area and under certain circumstances could provide FERC with limited siting authority.” The DOE is quick to note that National Corridor designation is “not a siting decision, nor does it dictate the route of a proposed transmission project.”

Presently there are two federally designated NIETCs: the Mid-Atlantic Area National Corridor and the Southwest Area National Corridor. The Mid-Atlantic Corridor includes some or all counties in DE, OH, MD, NJ, NY, PA, VA, WV, and DC, while the Southwest Corridor includes seven counties in Southern California and three counties in western Arizona.

For more information and maps see: http://nietc.anl.gov/nationalcorridor/index.cfm.

Natural Gas Pipelines

Much like energy transmission lines, natural gas pipelines can be above or below ground and require subsidiary infrastructure for regular maintenance. Access and maintenance roads can be especially impactful and are just as permanent as the pipeline itself. Pipelines also require numerous compressor stations, storage facilities, and feeder pipes to end-users.

The existing natural gas pipeline infrastructure is heavily concentrated in the Ohio River Valley, western Oklahoma, west Texas, Louisiana, and the Gulf Coast from south of Corpus Christi, TX to east of New Orleans, LA.
On average it takes roughly three years from the time a new pipeline is proposed to the time that pipeline is in service (U.S. EIA, n.d.). The first phase of pipeline development is known as an “open season” for 1-2 months, during which parties interested in purchasing a portion of the new pipeline’s capacity rights make themselves known and are given an opportunity to sign a non-binding agreement with the developer. If enough interest is shown, the developer will move forward with the project.

The next step is to file for approvals with the appropriate federal, state and local regulatory agencies. If the pipeline is an interstate pipeline, the primary federal regulator is FERC. It is worth noting that if FERC approves the project, the developer has the right to use eminent domain (as authorized under Section 7(h) of the Natural Gas Act (NGA)) if good faith negotiations with private landowners are unfruitful.

There are several alternatives to new pipeline development if the goal is an increase in regional pipeline capacity. These include: (1) converting an existing oil or product pipeline to a natural gas pipeline; (2) adding a parallel pipeline along a segment of existing pipeline, called looping; (3) installing a lateral extension off the existing mainline; or (4) upgrading and expanding facilities, such as compressor stations, along an existing route. If available, this last option is usually the quickest, least expensive, and has the least environmental impact, as it usually does not require the siting and construction of new roads and other maintenance facilities. Further, the marginal impact of new construction in an existing corridor is much less than the marginal impact of entirely new construction on previously undisturbed land.
Millennium Pipeline, New York

The Millennium Pipeline is a 181-mile, subsurface, 30 in diameter natural gas pipeline stretching along the southern extent of New York State from Corning, NY to the lower Hudson River valley. Jointly owned by NiSource Inc., DTE Energy, and National Grid USA, the pipeline serves markets along its route as well as the New York City area via interconnections.

The Millennium Pipeline delivers natural gas generated from the Marcellus Shale formations in western New York State. Opposed by many groups – conservation, environmental, and otherwise – including Riverkeeper and municipalities located in the right-of-way, the project faced many difficulties in the ten years it took to finish.

For more information see: http://www.millenniumpipeline.com/.

Roads

Roads come in all shapes and sizes and serve a multitude of purposes. Roads will accompany most other infrastructure projects, including transmission lines and pipelines. Obviously, roads are also used to transport people and goods. On this front, it is important to note that the number of highway vehicle miles traveled is expected to grow 60% from 2000 to 2030 (U.S. DOT RITA, n.d.). Accordingly, greater and wider roads are likely to be developed.

A key challenge for both the U.S. Department of Transportation (DOT) and conservation organizations is determining the “best” path – bearing in mind ecological, conservation, and social values – for these roadways. The impetus for road construction often arises somewhat organically – we need a way to get from here to there with these goods and services, what’s the best way to do that? Because the purpose of new road construction is often very specific, it can be difficult to entertain a great number of siting opportunities while continuing to meet the objective of the project. That said, various options do exist for many projects and the options can be evaluated on their relative merits. For example, not only can roads be sited in different places, they can also incorporate under- or overpasses that accommodate wildlife passage. This strategy has been successful in places like Banff National Park in the Canadian Rocky Mountains (Parks Canada). Conservation organizations might play a key part in optimizing such strategies.
Traditional Conflicts with Conservation Organizations

Conservation organizations – especially small, all-volunteer outfits – have often been founded to oppose proposed development. They have reason to worry. The construction of new electrical transmission lines, for example, entails the installation and maintenance of service roads and the clearing of land for substations and other transmission equipment. All of these come at the cost of acres that might otherwise serve as working forests, recreation lands, wildlife habitat, or a culturally important viewshed.

At the same time, the narrow focus and action that enable these groups to conserve the individual sites they cherish may preclude them from engaging on how best to balance larger, regional-scale, social and economic needs with environmental concerns. Their actions may also, however, create new incentives for developers and regulatory agencies to think and engage more widely about the approaches they propose.

Eco-Logical – An Ecological Approach to Developing Infrastructure Projects

Eco-Logical is a U.S. government program designed to “better avoid, minimize, and mitigate” negative impacts to habit and ecosystems created by various forms of infrastructure. The program has wide acceptance in the national government having been approved by the heads of the Forest Service, National Park Service, Federal Highway Administration, Environmental Protection Agency (EPA) Office of Federal Activities, EPA Office of Wetlands, Oceans, and Watersheds, Bureau of Land Management, Department of the Army, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, and U.S. Fish and Wildlife Service.

In the words of the program administrators: “Eco-Logical encourages Federal, State, tribal and local partners involved in infrastructure planning, design, review, and construction to use flexibility in regulatory processes. Specifically, Eco-Logical puts forth the conceptual groundwork for integrating plans across agency boundaries, and endorses ecosystem-based mitigation.”

Mitigation efforts focus on the following four goals, in the words of the program:

1. Conservation – Protection of larger scale, multi-resource ecosystems.
2. Connectivity – Reduced habitat fragmentation.
3. Predictability – Knowledge that commitments made by all agencies will be honored, i.e., that the planning and conservation agreements, results, and outcomes will occur as negotiated.
4. Transparency – Better public and stakeholder involvement at all key stages in order to establish credibility, build trust, and streamline infrastructure planning and development.

For more information see: http://www.environment.fhwa.dot.gov/ecological.
Opportunities to Move Forward

Land is conserved for many reasons, including maintaining sensitive biological communities, preserving viewsheds and other aesthetic qualities, enabling recreational activities, and protecting rural livelihoods. Understanding the specific reasons a given parcel is conserved is important to determining ways in which development can work in accordance with site-specific conservation objectives.

The development or redevelopment of infrastructure corridors happens for many reasons and can have a great or relatively minor impact on the environment within which it is sited. Adding an additional lane to an existing highway, for example, has a marginally smaller impact on its immediate environment than the development of an entirely new roadway. Evaluating and contextualizing development impacts relative to each other seems to be at the crux of the siting challenge and is certainly a place where conservation organizations might work together with developers to appropriately weigh various opportunities. In California, for example, conservation groups including the Sierra Club and NRDC are working with developer Southern California Edison (SCE) to best site roughly 153 miles of new 500-kV transmission lines (Conservation Groups, 2009; SCE n.d.). These new lines will bring renewable energy generated in rural areas to urban consumers. By choosing to work with, rather than against, the developer of these transmission lines, Sierra Club, NRDC and other conservation organizations are offering informed opinions on how to site the lines so that the vision of increased renewable generation can be achieved while the ecological integrity of affected areas is maintained.

The above example highlights a more proactive position on infrastructure development. This position assumes that some development will take place, and that simply saying “no” may be counterproductive to larger conservation goals. If renewable energy is to comprise a relatively higher proportion of the total energy produced in the United States, additional infrastructure will be required. Since most conservation organizations support the increased utilization of renewable energy sources, they are going to have to address the connecting infrastructure as well. Entering into conversation with developers at the early stages of a project may help that project succeed in a way that benefits not only the developer, but also regional conservation efforts and communities at large.

Discussion Questions

• How much can we focus our need for expanded infrastructure into corridors or areas that have already been developed?

• How can we think about infrastructure on a regional basis, so that it can fit into a broader plan for a mix of land uses?

• How can conservation organizations work in partnership with private developers and government agencies to facilitate the (re)development of smart infrastructure corridors?
Organizations Doing Interesting Work

Resources for the Future informs the policy debate on issues of natural resource management and energy through objective social science research and reporting. See www.rff.org.

PAD-US Partnership is working to catalogue protected lands across the nation to help planners and developers’ craft better decisions about local, regional, and indeed national development strategies. See www.protectedlands.net.

Piedmont Environmental Council advocates for a smarter grid and an increased proportion of renewable energy primarily in Virginia. See www.pecva.org/anx/index.cfm/1,121,0,0,html/Energy-Solutions.

American Wind and Wildlife Institute is working actively with developers to help promote and site wind power generation facilities. See http://wind.tnc.org/awwi/.

The California Energy Commission: Renewable Energy Transmission Initiative (RETI) is a statewide initiative to help identify the transmission projects needed to accommodate the state’s renewable energy goals. It is supervised by a coordinating committee comprised of California entities responsible for ensuring the implementation of California’s renewable energy policies and development of electric infrastructure. See http://www.energy.ca.gov/reti.

Defenders of Wildlife’s Habitat and Highways Campaign seeks to reduce the impact of roads on wildlife, as well as to incorporate wildlife conservation into transportation planning. See http://www.defenders.org/programs_and_policy/habitat_conservation/habitat_and_highways/index.php.

Useful Readings/Works Cited


### 4.2: Examples, sources of information and other key points from the discussion

Some of the examples, sources of information and key points from the discussion included the following:

- Transportation planning and investment represents a huge opportunity for the conservation community – although most transportation funding is for maintenance and repair, rather than the construction of new corridors.

- Transportation projects and funding are mostly based on long-term planning processes, periodically interspersed with rapid funding decisions. Different scenarios on possible transportation corridors are devised and assessed against relevant criteria. States prepare 20-year plans, six year plans and budgets covering one to two year cycles. Environmental considerations, in particular air quality requirements, are addressed in these plans. All projects that flow from these plans are subject to reviews and possible impact assessments under NEPA.

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**Regional Transportation and Land Use Decision Making in Metropolitan Areas**

In 2010, an interdisciplinary team from National Policy Consensus Center and University of Oregon conducted a study examining the arrangements and mechanisms for integrating land use and transportation in metropolitan regions and assessing these arrangements based on current practice and future potential. The four case study regions were: Portland, OR; Puget Sound, WA; San Diego, CA, and Denver, CO. In addition, a research forum was held in September 2010 to share findings, discuss implications, identify lessons learned and develop best practices.

For more information see: [http://www.policyconsensus.org/publications/reports/index.html](http://www.policyconsensus.org/publications/reports/index.html)

- Federal rules are requiring more stakeholder engagement and consideration of strategic regional mitigation strategies in these planning processes, which can lead to programmatic mitigation agreements, advance mitigation, and banking instruments that are done pre-NEPA or in conjunction with NEPA reviews. This is designed to encourage context sensitive design, following regional ecosystem frameworks, and to identify potential stakeholder siting concerns before designs are well underway. Final designs can better incorporate local knowledge and preferences, eliminate conflicts and, ideally, accelerate the decision-making process.

- An increasing number of conservation and transportation planning workshops are being held to try and map out both sensitive areas, as well as those better suited to transportation corridors. More penetration of such efforts into more regions is required.
New sustainability and transportation tools are being developed for use by states in their planning efforts. Transportation for Communities – Advancing Projects through Partnerships (TCAPP) organizes information to support the transportation decision-making process. See: http://onlinepubs.trb.org/onlinepubs/shrp2/CapacityBrief.pdf.

At least in the area of transportation planning a “new normal” seems to be developing in which layoffs of environmental staff create opportunities for more engagement by environmental groups that can provide information in support of planning efforts.

Transportation agencies are increasingly hopeful about the opportunities for conservation banking. Regulatory platforms for such banks need to continue to be strengthened so that they become real options for transportation projects.

Land trusts accepting easements from mitigation projects are often looked down upon by other conservation organizations – even though they are increasingly sophisticated in their knowledge of ecological needs and opportunities.

Transmission Line Upgrade – New Jersey Highlands

When the New Jersey Public Service Electric & Gas Company (PSEG) proposed to upgrade its transmission line through the New Jersey Highlands, they applied for an exemption from the application of Highlands’s rules and from the Highlands Regional Master Plan. The New Jersey Highlands Act provided an exemption for the upgrade of public utility systems but in order to be granted the exemption PSEG had to work with the Highlands Council to mitigate the impacts of the project to be deemed consistent with the resource protections goals of the Highlands Act. The Highlands Council had developed extensive data and mapping (57 layers of information) which were used to judge the impacts of the proposed upgrade. The approach taken was to avoid, minimize and mitigate any adverse impacts to resources. Protection and/or management plans were required to protect natural resources. Included also was a mitigation funding plan to protect the existing character of the Highlands Region and encourage eco and agri-tourism. The methodology used would generate $18.6 million in mitigation funding from PSEG, to be applied first to acquisition and stewardship projects in the 10 most affected towns.

For more information see the Comprehensive Mitigation Plan negotiated with the Highlands Council at: http://www.highlands.state.nj.us/njhighlands/projectreview/pseg_amended_051909.pdf.
- Conservation organizations should always have restoration/preservation projects ready to tee-up should mitigation funding opportunities suddenly appear from infrastructure projects.

### Biodiversity Mitigation Banking in Colombia

Working with the Colombian government, The Nature Conservancy (TNC) has been helping to build biodiversity mitigation banks in the country. Biodiversity maps have been developed for different regions. Zones of impact have also been created to allow mitigation ratios — more mitigation for impacts on more sensitive sites — to be developed. Watershed scale activities are increasingly the focus of these efforts. In April of 2008, TNC helped launch a conservation trust fund to protect rivers and watersheds in Colombia, which will draw from mitigation funding as well as voluntary investments from urban water treatment facilities. TNC projects the fund to raise $60 million for conservation projects over the next ten years.

For more information see: http://www.nature.org/ourinitiatives/regions/southamerica/colombia/howwework/water-fund-bogota.xml.

- Increasing numbers of new or upgraded electrical transmission corridors are being proposed across the country, as part of efforts both to build a “smarter grid,” as well as to add new generating capacity (including from renewable sources). For example, New York, Vermont and New Hampshire are all seeing efforts underway to site transmission facilities to bring hydropower from Quebec into the Northeastern grid.

### Transmission Line Upgrade – Vermont

When the upgrade of a transmission line from Rutland to Burlington, Vermont was announced, the Vermont Land Trust (VLT) learned that 14 of its conserved properties were going to be affected. Since their evaluation found that identified alternative corridors would have even greater impacts on conserved lands, VLT focused its efforts on creating minor adjustments to the corridor and ensuring adequate compensation to landowners in the region. They did find that contractors working on corridor acquisition failed to identify or account for VLT’s ownership of development rights on target properties, failed to consider the site-specific impact of system location and construction disturbance on farm operations, and grossly undervalued the compensation owed to farm owners.

For more information contact: VLT Vice President of Conservation and Stewardship, Dennis Shaffer at Dennis@VLT.org.
• An increasing, but still small, number of conservation organizations are actively involved in these planning efforts with either the utilities or state public service commissions involved.

• Major questions arise about the scale of government at which decisions on infrastructure corridors should be made. For example, unlike natural gas pipelines, there is as of yet no federal regulatory procedure in place for the siting of transmission lines. Discussions continue on whether and how one might be in place.

### I5 Corridor Reinforcement Project, WA

As part of the planning for improvements to an existing transmission line along the I5 corridor in Washington State, the Bonneville Power Administration (BPA) conducted three years of public outreach in an effort to minimize the environmental impacts of the work. Maps of alternatives, showing environmentally sensitive areas (wildlife, habitat) were developed in collaboration with numerous groups. But still, efforts to identify routes that had the least impact overall were often impeded by “one issue” groups unwilling to consider any other factors. To date BPA has received over 8,000 comments from landowners and other stakeholders on their proposed transmission route segments. A draft Environmental Impact Statement for the reinforcement project is due for release this fall for comment from the public.

For more information see: [http://www.bpa.gov/corporate/I-5-EIS/documents/How_route_options_are_evaluated_and_decisions_are_made.pdf](http://www.bpa.gov/corporate/I-5-EIS/documents/How_route_options_are_evaluated_and_decisions_are_made.pdf).

• It appears more difficult than one might think to consolidate transportation, transmission and pipeline corridors – although integrated planning efforts are worthy of continued effort. For example, concerns over static electricity require minimum distances between transmission lines and gas pipelines. Also, burying transmission lines can be up to 10 times more expensive than placing them above ground.

“Zones for renewable energy development without transmission corridors are cemeteries.”

— Arthur Haubenstock, BrightSource Energy