Integrating Community-Based Conservation Principles into Power Sector Planning: A Proposed Framework for Practical Action

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I: Introduction and project context

The Nature Conservancy (TNC) works to address the world's most critical challenges to protect the lands and waters that nature and people depend upon. To achieve this, TNC works on issues designed to protect and restore lands and waters, tackle climate change, provide food and water sustainably, and build healthy cities. Cutting across these agendas, and fundamental to human economic development and conserving the planet, is the modern energy system. While the role of The Nature Conservancy is not to maximize energy generation, we recognize that more electricity will be needed to meet a growing human population on the planet, reduce poverty, and fuel economic development. Given that energy infrastructure additions will be necessary for the foreseeable future – combined with continued improvements/investments in energy efficiency – TNC is working to help governments, utilities, developers, communities and other stakeholders develop plans for achieving their energy expansion goals with renewables, in a configuration that allows for the fewest impacts to nature and people with reasonable, or even improved, economic and financial performances for power systems.

Project background and purpose

A key pillar of implementing TNC's vision of maximizing the deployment of low-impact renewable energy involes integrating smart siting practices with long-term power sector planning ('capacity expansion planning'). This kind of planning is done by governments and utilities, typically with a 20-30 year timeframe in mind, to determine (1) a forecast of energy needs, (2) the kind of energy mix that will meet those needs, and (3) where this energy is to be procured from. These plans are then used to inform the power sectore procurement strategy and and necessary regulatory reforms which shape energy project siting and associated transmission planning. Traditionally, power sector planning does not seriously represent or attempt to minimize impacts to people and nature. Moreover, such planning exercises rarely incorpate platforms for community involvement to provide input during the process.

It is the charge of this project to address this gap, specifically by defining a practical framework for integrating low-impact siting practices into traditional power sector planning approaches, and furthermore to identify the entry points in this framework for transparent and additive participatory processes, specifically, community-based engagement (note: appropriate approaches for community engagement differ among scales and time frames for planning and can have a range of benefit and challenges). The intended user of this framework includes TNC staff, NGOs, as well as members of energy planning agencies / regulatory bodies that embrace the vision of integrating progressive participatory practices and best-practice siting into capacity expansion planning efforts.

This document is organized in four sections. It begins with an overview of recent energy sector trends, which have driven the modern resurgence of interest in power sector planning. This is followed by a technical section that provides a 'how-to' for capacity expansion planning, as well as indicates where in it is possible to embed impact avoidance 'wins'. The document follows with a primer on particicpatory engagement processes in the energy, highlighting a series of examples to provide a sample of the various forms this can take. Lastly, via a workshop survey, a set of practical 'entry points' is identified for how The Nature Conservancy can embed low-impact siting and participatory principles within the capacity expansion process.

A (very) concise summary of energy sector organizational trends

Historically, most energy systems internationally were government-owned and vertically-integrated monopolies. This arrangement created strong linkages between sector planning, investment, electricity generation, transmission, and local distribution. Privatization of the energy sector kicked off with Chile in the early 1980s, and the resulting cost declines in energy pricing led many countries to mimic the country's vertical and horizontal unbundling model. These initial forays with privatization did not always face 'smooth sailing' - for example, Chile's 1982 Electricity Act was amended three times in 1999, 2004 and 2005 following major electricity shortages. It took considerable time and experimentation for governments to understand how to appropriately guide energy development via regulation and auction processes to simultaneously harness competitive markets to deliver 'low-cost' generation while simultaneously achieving other energy objectives, such as resilient and stable supply. The privatization model was followed by England and Wales (1986), and US municipalities and other countries quickly followed suit. Today, most countries have allowed for privatization in at least some aspects of their electrical sector, often leaving additional generation projects to independent power producers and distribution to private distribution companies. Exceptions remain, such as in most of sub-Saharan Africa, where publicly owned companies still dominate the electric utility industry (e.g., utility companies are controlled by one or more ministries of government). As a result, the state has enormous control in matters such as the tariff setting, investment decisions and programs by top managerial staff, energy pricing (e.g., power purchase agreements), and energy planning.

The organizational management/ownership reforms in the power sector have had a significant impact on the history and use of power sector planning tools. Until the 1980s most government-owned utilities implemented planning programs as a course of regular public sector operations. With privatization around the world, many countries saw a reduction in planning for the sector. Later, following various energy crises around the world and with the diversification of power generation resources, a renewed approach to planning – integrated resource planning (IRP) – increasingly came into favor. Planning approaches were further complemented by public policies and regulations that sought to stimulate and/or protect the interests of citizens.

A revolution in power generation options

With time, more power generation alternatives have become competitive and have led to significant diversification in the sector. Originally, coal, single cycle natural gas, nuclear, and hydropower dominated the approaches utilities used for electricity. Throughout the 1980s and 1990s, new alternatives became available, including combined cycle natural gas followed by utility-scale wind and solar. This was also a time when energy efficiency measures became a real option for utilities in resource planning. The expansion of generation and efficiency alternatives (and in response to energy shortages/crises) further contributed to the impetus for utilities to exercise integrated resource planning approaches. As a result of technological advances, solar photovoltaic and wind generation, coupled with storage options, now challenge the economics of conventional coal and gas-fired generation in many markets, without subsidy.[i]

At the same time, a variety of national, sub-national, and utility entities are embracing increasingly ambitious policy goals to guide the development of their power sectors. These range from involuntary requirements such as renewable portfolio standards and the Clean Air Act, to recent ambitious voluntary commitments by a variety of countries, US states, cities, and utilities to reach 100% renewable power systems. For example, more than 180 countries have submitted their commitments to greenhouse gas reduction in the form of Nationally Determined Contributions under the Paris Agreement, reflective of their ability and capacity to reduce greenhouse gas emissions, as each country set its own targets and actions.

These developments have changed the power sector from a sleepy monopoly structure to one of the most dynamic sectors of our global economy. To ensure both (1) the reliability of the modern energy sector while increasing the share of variable renewable energy, and (2) the achievement of ambitious policy commitments, governments and utilities everywhere are placing greater emphases on more effective power system planning.

TNC's role in a changing energy landscape

A key emphasis of TNC's efforts has been to show how development objectives can be met while simultaneously reducing, or ideally eliminating, impacts to nature and people. Traditionally this work – which originated under the 'Development by Design' banner and has expanded to include a separate Hydropower by Design framework – has focused on single economic/infrastructure sectors, e.g., mining, transportation, or energy. Furthermore, within energy-related work, science practitioners on the Lands and Water sides have historically operated separately given differences in analytical techniques.

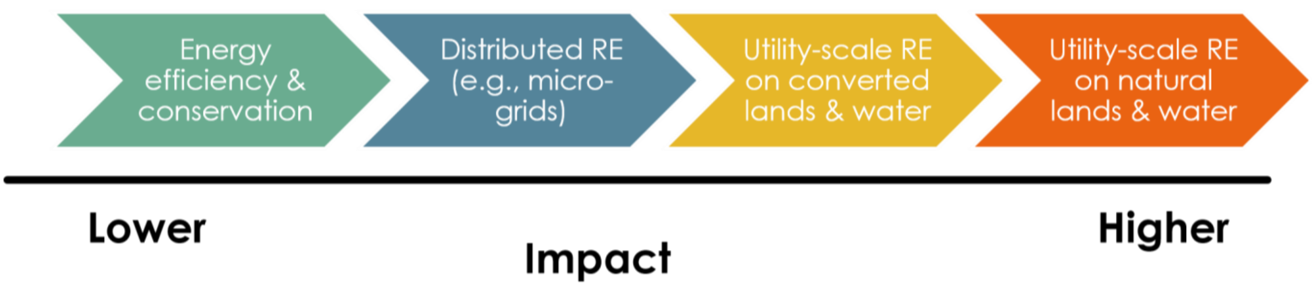


Figure 1. Hierarchy of Renewable Energy (RE) development, from lower to higher impact on nature

However, some of the largest gains to be made in terms of avoided energy-related developmental impacts is by helping shape power sector planning efforts. For example, integrating with power sector planning exercises theoretically provides an opportunity to advocate for demand management solutions (which are both low-cost, and *zero* impact), shifting the overall energy matrix (e.g., away from high-impact hydropower in path-dependent economies which could promote low-impact variable renewable resources), and strategically siting transmission networks (Figure 1). In this respect, the recent upsurge in interest by governments and utilities to conduct thoughtful power sector planning creates a potential entry point for TNC's conservation and policy staff.

The avoidance of detrimental impacts on people, particularly indigenous peoples and the rural poor who are dependent on ecosystem services for their livelihoods, has more recently become a significant component of TNC's mission. This new focus is relevant within the context of energy planning, as community conflict avoidance can reduce energy project costs by reducing project delays, abandonment, mitigation, compensation requirements to communities, or legal action motivated by social conflicts.

Conversely, decentralized energy projects such as rooftop sources provide electricity without many of the associated infrastructure needs and impacts, such as roads and transmission lines (though they tend to increase investments by distribution utilities in the existing grid). However, they do not meet many growing demands for energy for large industries or export and can lack attractiveness to energy developers. The approach to energy development will thus differ depending on the country, given different energy needs, socioeconomic, environmental, and political contexts, and opportunities for renewable sources to be developed.

II. Power sector planning: a 'how-to' primer and where conservation fits in

To understand the entry points for low environmental- and social-impact energy development, it is important to first describe and understand what is entailed by the discipline of power sector planning. The phrase 'power sector planning' represents a broad tent, embracing the various medium/long term planning elements that relate to the energy sector, including generation, and the means for delivering power to customers via transmission and distribution. On the electricity generation side, these include considerations of power plant investment and retirement prioritization, transmission and distribution planning, integration of variable renewable generation into the grid, considerations of how to meet pre-determined policy regulations (e.g. climate commitments or environmental targets), and day-to-day grid operation to seek a reliable supply economically. There are multiple models for power sector planning, with Integrated Resource Planning (IRP) being the most common.

The following represent some of the key typical questions answered by power sector plans:

1. **Data and Resource Assessment**
    - <u>Power System Tracking</u>: What are the existing generation/capacity/ fuel use/policy commitments, e.g. How much natural gas capacity is in a region? What is the balance between baseload/firm and variable resources? What is the reliability of various resources, including price volatility of imported fuels? What are the technology trends? *How to assess: simple spreadsheet evaluations to provide high-level analyses of existing power system data.*
    - <u>Resource Assessment</u>: What resources (e.g., solar and wind potential sites) are available for development? *How to assess: spatially & temporally explicit resource assessment models combining layers of information to screen for attractive areas in terms of economic attractiveness and low expected social and environmental impacts.*
2. **Generation and Transmission Capacity Expansion**:
    - <u>Forecasting Demand</u>: The planning process usually begins with a forecast of the electricity demand. Key drivers include: What is the forecasted population growth rate? What are the prospects for economic expansion? What are the plans for energy-intensive projects, such as large mines that need to be considered? What are the energy efficiency measures and what can be expected from energy efficiency labeling programs?

- Reaching Targets: How to plan resource portfolio for the future (generation, retirements)? What type of generation should be built to meet demand (technology, location and size)? What are the required transmission reinforcements?
- Respecting Constraints: How does the optimal system change with constraints on emissions or with development goals? How can the system be optimized to deliver reliable, least-cost power under specified environmental constraints?
- Regulation evaluation: What are the costs, rate impacts, and welfare implications of alternative power sector policies/regulations?
- *How to assess*: *Capacity expansion models for the medium and long term, ideally coupled with production cost models and – if penetration or variable renewable sources is relevant – complemented by electric studies, such as grid stability.*

3. **System Operation**:
   - Least-cost operation: Given a generation and transmission system, what is the lowest cost way to operate the system while maintaining reliability given uncertainty and other constraints?
   - Network reliability: Will the transmission system work under periods of high load? Will the system remain stable after the loss of a large plant? Will the loss of a transmission line cause instability and cause generators/section of the network to disconnect from the grid?
   - *How to assess*: *Production cost model (model grid over near-term e.g. 1 week to 1 year, but at higher temporal resolution e.g. hours to five minutes). Note that production cost models can be 'coupled' with capacity expansion models to validate & correct results*

In terms of prioritizing efforts for this project, we are focusing on the elements of power sector planning where avoidance of impacts to people and nature, as well as the inclusion of participatory planning processes, can be most readily integrated. Therefore, the emphasis of this document will neither be on goal-setting (which happens before the power sector planning process) nor on system operation principles (which assumes a given generation and transmission system). Phrased differently, this document will focus on the elements of power sector planning related to capacity expansion planning.

The capacity expansion planning process

As Figure 2 demonstrates, capacity expansion planning requires a set of core inputs (blue boxes), conducting analyses (grey boxes), and then implementing a near-term action plan to deliver the preferred investment portfolio (green boxes).

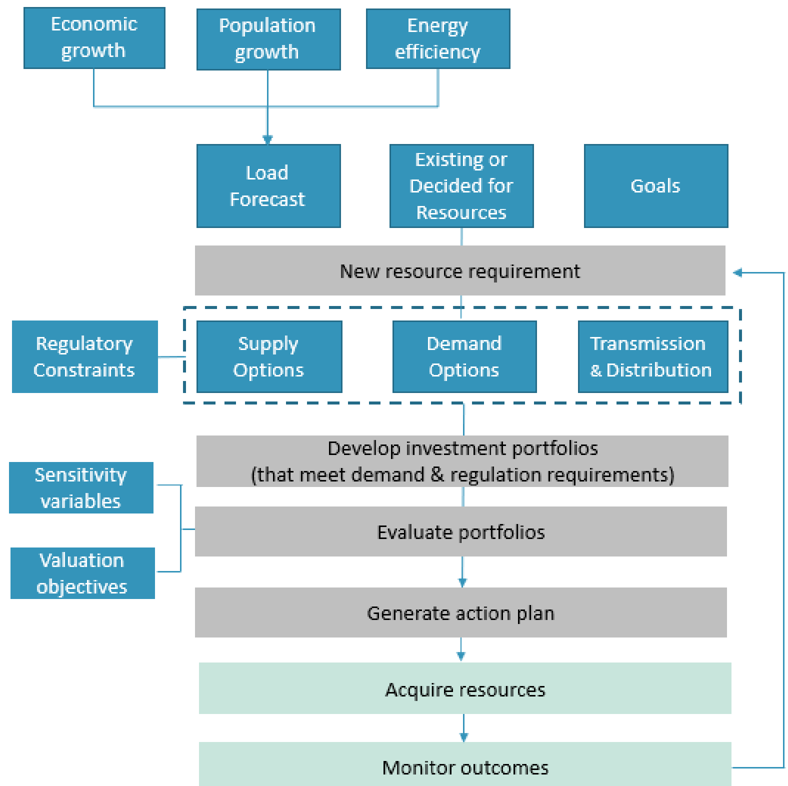


Figure 2. Generalized Capacity Expansion Planning Schematic

Some key elements in this schematic to highlight include:

- *Load forecast:* Evaluates both annual peak and overall energy requirement. Should be based on realistic assumptions regarding local population changes, economic factors, and planned energy efficiency measures. Should incorporate reliability redundancy, e.g. reserve margin on top of forecasted peak demand. Note that this factor can change quickly, especially during recessions.
- *Supply options*: Should include the full range of supply options, with reasonable assumptions about costs, performance, and availability of each resource (including thermal, hydropower, renewables, storage, and market transactions). It is considered prudent and best practice to model a range of possible costs and construction lead times. In the case of wind and solar power, an additional important task is to investigate system-level requirements to address generation variablility using production cost modeling scenarios. This is related to reserve requirements.
- *Demand options*: Historically, power sector planning did not typically consider demand options. However, such options often present the lowest costs and are certainly the lowest impact. Such options range from demand-side management measures, production efficiency upgrades, measures designed to impact time of use (pricing measures to shift demand), and reduction in demand due to distributed energy resources (e.g., behind-the-meter solar PV). Furthermore, demand options often help reach pre-determined goals such as emissions targets or air quality requirements. Ideally, “supply curves” using levelized cost of electricity (which is calculated by dividingin full-cycle lifetime costs by energy production, thereby allowing for the comparison of different electricity generation methods on a consistent basis) should be run for both Demand and Supply options.

- *Sensitivity variables*: Sensitivities should be run for key variables which represent meaningful risks towards achieving the model investment portfolio; obvious variables like this include fuel price projections, load forecasts, technology changes, and expected capital/operating costs.
- *Valuation objectives*: Capacity expansion plans always incorporate least-cost objective functions. However, additional objectives can also be added that reward fuel diversity, promote reliability, and minimize social & environmental impacts.
- *Action plan*: Capacity expansion plans are usually framed over 10-20 year periods. However, the analysis should be followed by an action plan indicating how resource prioritization will occur over the next 2-5 year period with a view towards eventually attaining these long-range targets.

Capacity expansion modeling

Capacity expansion models (Figure 3) simulate generation and transmission investment, while making assumptions about future electricity demand, fuel prices, technology cost and performance, and policy/regulation (Figure 3). These models can be informed by imposing pre-determined constraints (e.g. reserve margins, emission limits, or Renewable Portfolio Standard requirements), and feature objective functions that traditionally focus on cost-minimization, but could also embrace multiple objectives (e.g. system reliability or impacts minimization).

Typical outputs of capacity expansion models include annual generation, generation & transmission capacity builds and retirements, emissions, fuel consumption, and electricity prices.

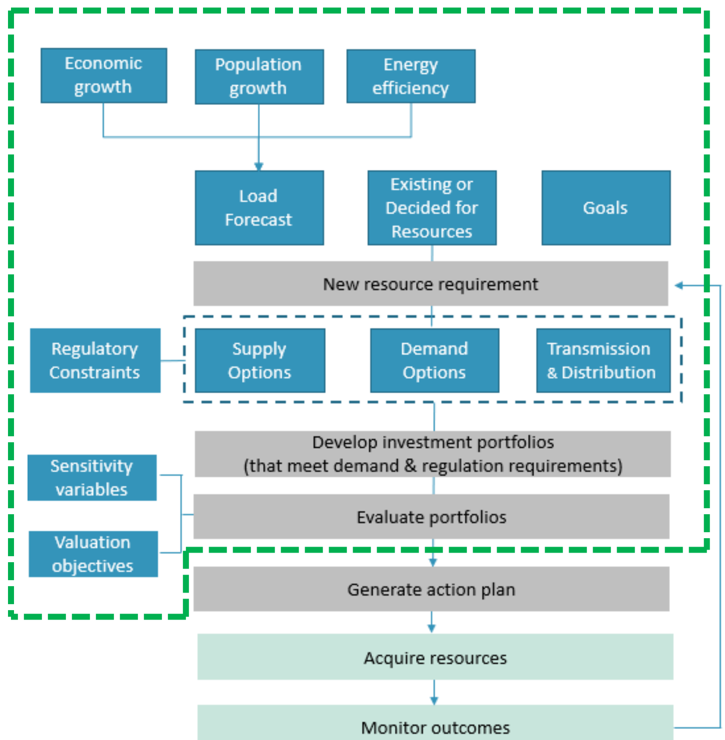


Figure 3. Aspects Addressed by Capacity Expansion Models

- *What they do well:* Examine impacts of power sector policies, or alternative technology fuel trajectories, on generation and capacity mix over medium/long-term.
- *What they don't do well:* Many don't have the chronological unit commitment, and transmission & power flow are stylized representations. These limitations are increasingly important due to short-term variability of renewables production and the impact of distributed generation and demand response to price signals.

Some examples of commonly used capacity expansion models include:

- *National-scale:* Regional Energy Deployment System (ReEDS), MARKAL, OPTGEN
- *Utility-scale:* SDDP, Resource Planning Model (RPM), PLEXOS, MIDAS, Strategist

Additional pertinent aspects to bear in mind while assembling capacity expansion models include:

- *Regionality*: Geographic scope, cost-of-service versus competitive regions
- *Temporal resolution*: Time of day & seasonality (note: will not have an *operational* degree of resolution; these questions are answered by production cost models, as noted above)
- *Time horizon*: Typically between ten to thirty years; note that climate change may have material long-term consequences to renewable resources, hence warranting expanding simulations beyond 30-year period
- *Representation of generating units*: Can either be stylized 'model' plants, or represented on a bespoke individual basis. Also, need to consider the representation of capital and other production costs
- *Renewable energy generating units*: Articulate which technologies are represented in the model; transmission accessibility cost for connecting to load centers; and representation of capacity value (indicates how much energy is produced by the plant, compared to its maximum output)
- *Transmission representation*: Individual lines, or aggregated

How to integrate social and environmental considerations in capacity expansion portfolios

A variety of methods exist for integrating environmental and social impacts analysis into capacity expansion planning exercises. We present three options below.

Option #1: If the goal is to *represent environmental and social impacts* associated with different investment portfolios, then the selected generation sites in each portfolio need a cumulative, additive, and synergistic impact assessment.

The steps required to do this include:

1. Identify which values are important to represent;
2. Identify which metrics should stand-in for those values as part of the analysis; and
3. Analyze how candidate sites within the selected portfolio(s) score on each of the metrics (note: metrics should be considered on a cumulative impacts basis, if relevant). This would fall under the 'Evaluate portfolios' box indicated in Figure 3 above.

Option #2: If the goal is to *avoid impacts using a heirarchy of ranges of social or environmental metrics*, these can be integrated as *constraints* in the model. For example, if certain kinds of land are deemed be valuable, generation candidates and transmission facilities sitting on this kind of land are excluded from the available resource pool.

The steps required to do this include:

1. Identify which values are important to represent;
2. Identify which metrics should stand-in for those values as part of the analysis, and
3. Include constraints for limiting portfolios to those where metric values fall within reasonable bounds, e.g. maximum allowed greenhouse gas emissions (that will constrain the construction

of less efficient fossil fuel plants), minimum length of connected free-flowing rivers (to reduce impacts to riverine processes, migratory species, riverine transportation), or exclusion of high conservation value land areas (to maintain migratory corridors or avoid high biodiversity areas). This would in principle fall under the 'Regulatory constraints' box indicated in Figure 3 above.

Option #3: If the goal is to *explore the inherent tradeoffs* among competing objectives, multiple objectives can be analyzed simultaneously within the objective function of the model.

The steps required to do this include:

1. Identify which values are important to represent;
2. Identify which metrics should stand-in for those values as part of the analysis, and
3. Run a multi-objective algorithm to explore Pareto-optimal scenarios among the prioritized metrics. This would fall under the 'Develop investment portfolios' box indicated in Figure 3 aobve. *Note: There is no 'solution' in this case; a decision must be made about what degree of tradeoffs is an acceptable gain/loss among the different competing objectives.*

Values for consideration in capacity expansion modeling exercises

Capacity expansion modeling exercises – in particular for more complex Integrated Resource Planning processes – require quantifying resource development scenarios across a range of interests. These interests (framed as 'Values' in the below table) are integrated into different portions of the capacity planning model, depending on their nature and what the primary intent of the exercise organizers is.

Table 1 highlights a range of values, commonly associated metrics for those values, and where they might show up in a capacity expansion modeling exercise (per Figure 2).

Table 1: Examples of values and associated metrics considered within capacity expansion model

Values	Metric	Typical representation in model
Energy		
Goal/Demand	• MWh/yr	Constraint ('resource requirement')
Total system cost	• $/MWh	Objective function – least cost (or converserly: maximizing revenues)
Reliability	• Tolerance band	Constraint ('resource requirement')
Climate		
GHG Emissions	• CO2 tonnes emitted, sequestration capacity removed	Constraint ('regulatory constraint')
Climate change	• Tolerance ranges for solar radiation, river flows	Sensitivity variable
Social		
Livelihoods impact	• Fishery productivity decrease (tonnes/$/yr) • Productive lands lost (hectares)	*Options discussed in prior section*

	• Losses of flood-dependent agriculture, riparian grazing, transportation (Ha, Km)	
Cultural heritage	• Archaeological sites lost (#) • Religious, spiritual sites lost (#) • Indigenous use areas lost (Kilometers of river, hectares of land)	*Options discussed in prior section*
Environmental		
Landscape conversion Ecological process alteration	• Lands converted (Hectares) • Rivers, floodplains converted (Km, Ha) • Flow, sediment, nutrient alteration (Km, Hectares) • River fragmentation (Km connected networks) • Land-based migration corridors	*Options discussed in prior section*
Biodiversity	• Destruction/alteration of natural habitats, ecosystems, areas of biodiversity importance (Km, Ha)	*Options discussed in prior section*

Aspects of the capacity expansion planning process that allow for impact avoidance 'wins'

There are several areas within the capacity expansion modeling exercise that create space for conservation 'wins'. The list below articulates aspects where, should TNC position itself in an advisory or review committee capacity as part of the planning process, such conservation 'wins' are possible:

- *Goals*: Ensure that public sector goals which have been committed to (which presumably include impacts avoidance) have a direct connection to portfolio prioritization (i.e. there is a connection between 'Goals' and 'Valuation Objectives')
- *Regulatory constraints*: Ensure that regulatory mandates are being properly reflected in the analysis. More ambitiously, push that these constraints be made more stringent over time
- *Non-regulatory constraints*: Include lowering/avoiding impacts to values of people and nature which are not explicitly regulated, but are desired by society
- *Supply options:* Ensure that low-impact energy sources have been assessed and are included in the model.
- *Demand options*: Ensure that demand management and efficiency options are 'on-the-table'
- *Distribution & Transmission*: Ensure that D&T is represented accurately (and therefore that cumulative impacts can be adequately captured)
- *Sensitivity variables*: Ideally include climate change risks as part of sensitivity analysis

III: Incorporating participatory processes during energy planning

Stakeholder consultations are a necessary step to obtain the views of people who may be affected by development projects or may otherwise have an interest in their outcomes, and to inform them about changes that could affect them. When done properly, consultations can make a significant contribution to increasing the development impact and sustainability of development projects. Apart from the requirements of due process, there is evidence that well-conducted consultations improve project design and implementation.

Participatory processes and citizen involvement add value, increase sustainability and build support for projects. Local communities or representatives of sectors across communities (e.g. fisheries consortium, agriculture alliances) can provide important traditional knowledge, the cultural context of resource governance, and creative solutions to maintain rural ways of life while helping ensure compatible development (Waylen *et al.* 2010; Walters *et al.* 2015). Increased cultural understanding and trust building ultimately benefits the community, organizations, and the government's land agencies to build better collaborative relationships, increasing the likelihood of designing successful development projects (Stern 2010).

One of the main challenges is the disconnect in geographic scope between Integrated Resource Planning (e.g., system scale plans for a region) and consultation processes that typically occur at the project level. For example, the World Bank's guidance suggests that consultations can take place as part of an Environmental Assessment, a Social Assessment, or an integrated Environment and Social Assessment (World Bank 2011). When project impacts are distributed over large geographical areas, such as for large hydropower projects, the World Bank suggests community engagement should be held at several places (e.g., multiple provinces/states) to ensure all stakeholders are allowed to attend. Furthermore, the community engagement should be held within a short time interval so that there is minimum scope for misinformation about the project or its impacts, due to distortion of messages from one location to another.

There is no one right way of undertaking consultation. Given its nature, the process will always be context-specific. Recent work by PowerAfrica has provided helpful overarching

A Note on the Recent Spread of IRPs in the USA

Increasingly, utilities in the United States are engaging in "Integrated Resource Planning (IRP)."[ii] And increasingly, this planning includes participatory processes and oversight that elicit input from a broad range of stakeholders, including industrial and commercial customers, government officials, regulators, nonprofit organizations, community groups and individual end-users. The modalities of interactions run the gamut and include customer surveys, community meetings, draft reviews of IRPs, online comment forums, the passage of legislation and ballots, legal interventions by groups representing customers at regulatory hearings, and utility staff dedicated full-time to "community engagement."

To assess this from the non-utility viewpoint — that is, the community perspective — groups representing environmental or "energy" justice, clean energy advocacy groups, health groups and others have increasingly made energy planning no longer just the business of the utility, but their own. Organizations such as Illinois' Citizens Utility Board have sole mandates to serve as watchdogs of utilities. Suffice it to say, participatory processes in utility energy planning exist because of the work of the clean energy advocacy community over the last several decades; this community engagement does not exist because of the utilities' initiative.

guidelines for community engagement for rural communities in Kenya that can be applied elsewhere (Power Africa 2018). Community engagement should be a continuous process that is systematically integrated into the core business activities of development projects to (1) achieve a lower overall risk profile for the project, (2) avoid the likelihood of disputes and/or grievances, and (3) avoid the cost and/or time overruns during construction.

INTEGRATING COMMUNITY ENGAGEMENT WITH THE PROJECT CYCLE			
STAGE 1 Early Stage	**STAGE 2** Project Development	**STAGE 3** Arranging Finance/ Financial Close	**STAGE 4** Project Construction & Completion
Determine project viability and base case option to support commitment of funding for feasibility study	Refine base case to support commitment of resources to develop the project and invest capital; Undertake long lead time activities and obtain authorizations	Structure project to attract finance; Arrange finance on terms and conditions sufficient to execute all project agreements; Reach financial close	Commence construction and reach commercial operations date (COD)

INDICATIVE LEVELS OF COMMUNITY ENGAGEMENT				
INFORM Provide balanced, objective, accurate and consistent information to help stakeholders understand the problem, alternatives, opportunities and/or solutions.	**CONSULT** Obtain feedback from stakeholders on analysis, alternatives and/or outcomes.	**INVOLVE** Work directly with stakeholders throughout the process to ensure that their concerns and needs are consistently understood and considered.	**COLLABORATE** Partner with the stakeholder to develop alternatives, make decisions, and identify preferred solutions.	**EMPOWER** Place final decision-making in the hands of the stakeholder. Stakeholders are enabled/equipped to actively contribute to the achievement of outcomes.

Adapted from the International Association for Public Participation (IAP2) Public Participation Spectrum, 2014. (https://www.iap2.org.au/Tenant/C0000004/00000001/files/IAP2_Public_Participation_Spectrum.pdf)

For rural communities in developing countries, there can be huge logistical challenges associated with bringing many people together to a single site where public transportation and communications may be limited. For example, outreach for a resource extraction project in Democratic Republic of Congo required considerable time and effort in the face of these challenges. They were overcome through a series of village-level meetings, extensive use of local radio stations (both French and Swahili), the use of mobile phones (calls and text messages) to contact key people and mobilizing others, the creation of special posters depicting likely impacts, and local community presentations delivered in both Swahili and French to overcome language barriers (IFC of the World Bank 2007).

The matrix in Table 2 shows several typologies of participatory processes based on the characteristics they entail. As with all typologies, these are reductive as opposed to comprehensive with numerous variations on these themes. Implied in these categorizations is a series of questions:

- What participatory processes drive change in energy planning from the IRP to the nuts and bolts of siting assets on the land?
- What are the entry points that communities can engage in to effect change?
- What are the impacts/trade-offs of the future and manifold distributed renewable energy assets to be sited in communities and on the land around the world?

Finally, among the tools that communities have to affect change (collaboration, coalition, legal, voting booth, protest, funding advocacy groups), the answer to which participatory process is best might be “all of the above” if the scale (a state, a nation) of the energy planning and actions is big enough. That said, a likely intersection point between communities and renewable energy development is going to be at the local level. Furthermore, when communities engage—or are invited to engage—matters. Engaging at the conceptual stage (proactive), planning (responsive) and/or construction (reactive) determines, in part, the quality of the outcomes for local communities and the environment.

Table 2: Examples of participatory processes in power sector planning

Types	Political/Social/ Environmental Context/Drivers	Stakeholder Representatives	Scale	Pros and Cons	Participatory Entry Points
Legislative/ Regulatory Driven Example: Michigan IRP process led by Consumers Energy (an investor-owned utility)	• A decade prior of clean energy advocacy from NGOs • State laws mandating more energy efficiency and renewable energy	• Customer input at front end of process • Technical and legal interveners at public utilities commission • Active clean energy advocacy groups • Ongoing review of IRP	• 7 out 10 MI residents is a customer (7 million) • Statewide service territory	• 5 gigawatts of solar planned • 45-square miles needed; land use issue • Fighting Public Utilities Regulatory Policies Act	• Multi-modal: legislative, regulatory, advocacy, grassroots • Ongoing opportunities to participate • Understanding that RE siting would drive conflicts
Municipal-Driven Example: City of Boulder creation of electricity enterprise to decouple from incumbent investor-owned utility (ongoing)	• LUG (local unit of government) climate goals were going unmet by incumbent utility • Educated, progressive populace wanted more "local control" of their energy	• Boulder residents • Boulder government • NGOs: Rocky Mountain Institute	• City, understanding that the generation and transmission of energy is region, if not greater	• Audacious move to create a new muni in market dominated by "regulated" monopolies • May be too difficult and expensive to achieve	• Local government haggling with IOU utility & regulators • Residents voted on ballot in support of decoupling; voting in 2020 to continue or abandon effort

Community-driven Example: Creation of community solar park – 1,000 solar panels on capped landfill – in East Lansing, Michigan (2014-2018)	• Clean energy nonprofit convinced municipal utility to do project • Community survey showed ~90% of residents wanted this • Local climate change goals with plan (e.g., 100% RE for city operations)	• Clean energy nonprofit • City Commission on the Environment • Local elected officials • Neighborhood groups • Businesses and institutions	• Site-specific: a 2-acre site out of 20 acres • 150 customers when fully subscribed	• Adaptive reuse of land with no commercial value • Restoring habitat with native flora • NIMBYs	• Grassroots • LUG • Municipal utility • Ongoing awareness to drive more community solar
Coalition-Driven Example: Legislation to mandate more renewable energy (2018)	• Clean energy and environmental justice advocates drove law • Intensive and ongoing public engagement	• Social and environmental justice, health • Chicago neighborhood groups	• State-wide with target zones for solar development in disadvantaged communities	• Pushes further IL's deregulated electricity market • Emphasizes "energy justice" for low-moderate income populations	• Grassroots • NGOs • Participation in program, such as "hosting" solar arrays on property
NGO/ development-sponsored processes Example: Evaluation in Himalayan region of nature of benefits of small hydropower to local communities *(2006)*	• Are local benefits translating into global environmental benefits, and the involvement and perceptions of the local communities about the small hydel projects	• Interviewing Household members in rural communities in Hilly Regions of India	• 13 Himalayan states (400,000 km2) with a population of over 200 million	• Pros: Marginal increase in domestic economic activities; Stabilization of power supply; increased use • Con: Shift from community to state/private resource management	• Local Communities dependent upon natural resources

IV: Bringing it together: TNC's potential role in promoting low-impact siting and participatory processes in power sector planning

'Conservation entry points' within power sector planning

As a non-government organization with a mission to 'conserve the lands and waters on which all life depends', TNC projects are required to address how our conservation objectives will be advanced or achieved via a prospective effort.

As highlighted throughout the document, power sector planning – and its modern variant of Integrated Resource Planning – is a multi-faceted multi-stakeholder process with existing industry best practices. Therefore, it behooves TNC to examine *where* within such processes the 'conservation entry points' exist for us to make a difference.

During the workshop, we asked our group of fourteen participants to brainstorm a 'long list' of such potential entry points, and then evaluate these options against a set of criteria to help rank and prioritize the options. Each of the options within the 'long list' was mapped to the generalized capacity expansion planning schematic as presented in Figure 2 ('Schematic Relationship' column within Table 3).

Table 3: Results of 'Conservation Entry Points' workshop brainstorming exercise

Option #	Schematic Relationship	Description
1	**Goals**	Reference a broader set of goals, as selected via some form of participatory process (example goals include: Nationally Determined Contributions, avoided conversion per Brazil's forestry code)
2	**Develop investment portfolios**	Incorporate environmental & social information into capacity expansion modeling, including designingsocial and environmental metrics to identify low-impact candidate resources.
3	**Existing / Decided-for Resources**	Outside of the planning process, work with developers to ensure that approved projects in ~5 yr pipeline are socially and environmentally responsible
4	**Regulatory constraint**	Defining and enforcing best-practice regulatory standard, and ensure these are reflected as part of power sector plan
5	**Other**	Create market signal to developers (e.g. tax credit, auctions) to promote projects with superior environmental & social outcomes
6	**Other**	Clarify climate risks via market signals (e.g. insurance)

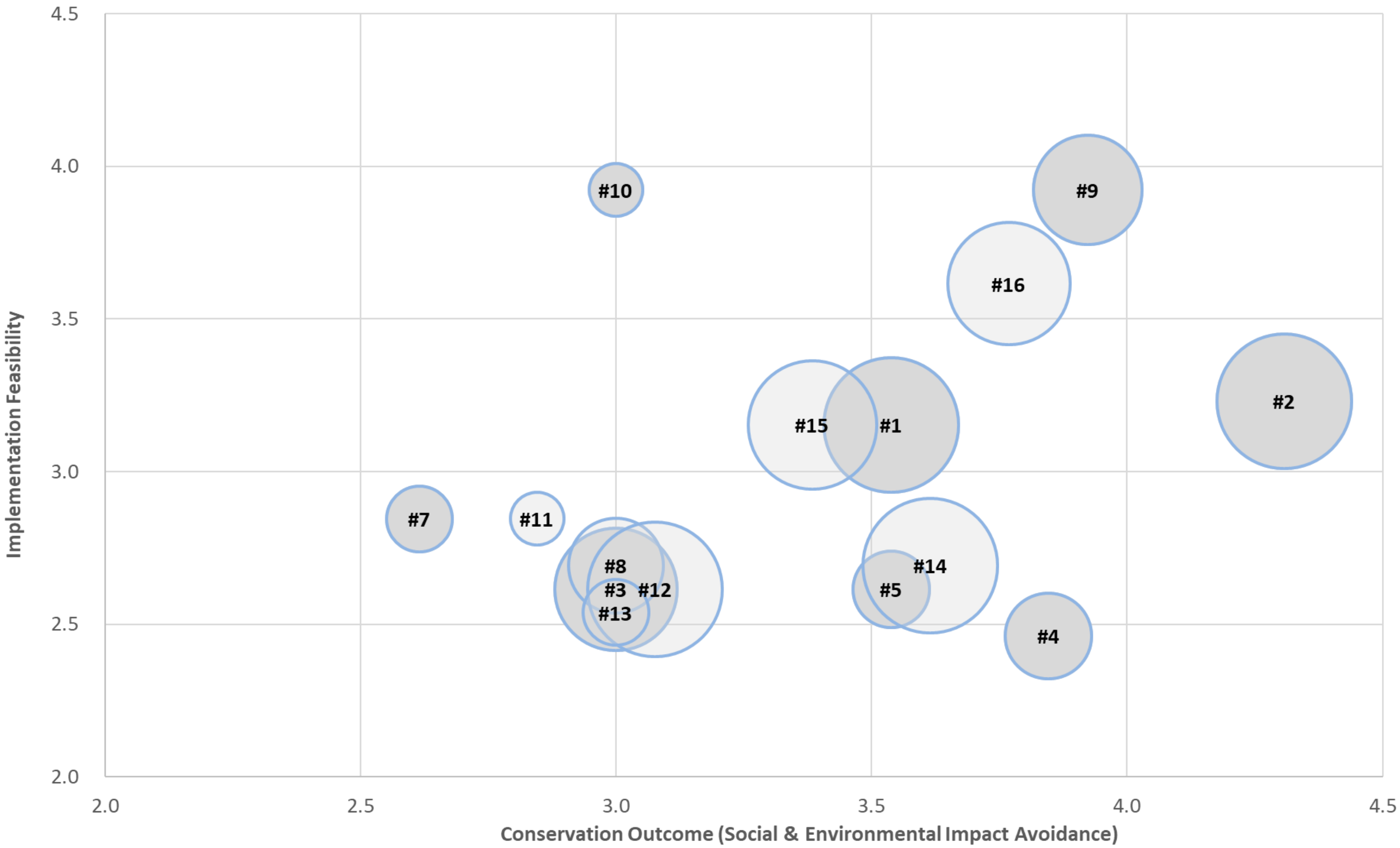
7	**Existing / Decided-for Resources**	Maximize utilization of existing resources (e.g. improve operations via sediment mgt)
8	**Supply**	Relax geography constraints to allow for regional planning (including interstate or international transmission projects)
9	**Evaluate portfolio**	Quantify and make transparent / understandable tradeoffs among investment portfolios
10	**Sensitivity variables**	Show climate change sensitivity for both supply and demand options
11	**Demand**	Ensure that demand options are made available and presented fairly vis-à-vis supply options
12	**Load Forecast**	Ensure electrification is part of power sector plan, and create strategies for communities lacking access
13	**Regulatory Constraint**	Leverage country accession priority (e.g. EU / OECD membership) to ensure adherence to social and environmental best practices.
14	**Evaluate portfolio**	Create authorized watchdog group that has formal role in reviewing/vetting process (quality control function)
15	**Monitoring**	Create monitoring function which tracks environmental and social impacts of implemented projects
16	**Other**	Provide capacity planning within utility/planner to help facilitate participatory processes

Following this brainstorming exercise, workshop participants filled out a survey that asked, for each of the sixteen 'conservation entry point' options:

- To rank, on a scale of 1-5, the *expected implementation feasibility difficulty level for TNC* (1 = hard to implement, 5 = easy to implement)
- To rank, on a scale of 1-5, the *expected potential to avoid impacts to people and nature (i.e. generate a 'conservation win')* (1 = low outcome, 5 = high outcome)
- To estimate, on a binary basis, whether the option *leverages the spirit of a participatory or community-based approach* (0 = no, 1 = yes)

Figure 4: 'Entry Points' Prioritization Matrix

Position of bubbles on x and y axes represents the average workshop group ranking of 'conservation outcome' and 'implementation feasibility'. The size of the bubble indicates the degree to which workshop participants believe that the respective option can integrate a participatory community-based approach, with high-scoring options (e.g. Options #1, 2, 12 and 14, scoring 92%) presented as larger bubbles than low-scoring options (e.g. Options #10 & 11, scoring 15%). Options correspond to descriptions as presented in Table 3. Note that this exercise was completed based on the experience and knowledge of the group participants, without any prior research or presumed knowledge, and the results should be reviewed in this light.



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Observations from ‘conservation entry points’ rankings

All of the options in the workshop ranking were both identified to be relatively feasible, and feature significant conservation benefits (i.e., no scores were recorded below 2.5 out of 5 on either axis). The potential level for participatory community processes did vary highly, from 0% (Option #6) to 92% (Options #1, 2, 12 and 14). With that said, the following ‘clusters’ were identified from the ranking process were identified that merit highlighting:

- #2, 9, 16, 1: These options respectively dealt with *evaluating environmental and social tradeoffs* within investment portfolios, *quantifying and making transparent the implicit tradeoffs among investment portfolio, providing capacity to facilitate participatory engagement,* and *helping set broader goal sets within the capacity expansion process.* This set of options was interesting because they were simultaneously the highest scoring (across all three criteria), are mutually self-supporting (creating a clear nexus of potential medium/ long-term engagement), and represent areas in which TNC has historically engaged with success.
- #6, 7, 11: These three options respectively referenced *clarifying risk via market signals, maximize utilization of existing resources e.g. sediment management to maximize existing hydropower resources, and ensure the fair simultaneous presentation of demand options vis a vis traditional supply options e.g., demand planning*. Each of these scored similarly low across all the ranking criteria (~2.5 for feasibility and conservation, <=15% on participatory engagement). It is noteworthy while each option represents a technical method that can theoretically improve outcomes for people and nature, none was deemed participatory and it was agreed that they represent items outside of TNC’s core area of expertise.
- #14, 15: These two options respectively addressed *creating an authorized watchdog group to review and vet the planning process,* and *creating a monitoring and evaluation framework to track the social and environmental impacts of implemented projects.* These options scored well regarding feasibility and outcomes, were deemed to be highly participatory, and represent a clear mutually-supporting nexus that might form the basis of programmatic activity TNC could be engaged in.

Potential roles for TNC in the power sector planning space

Following the identification and ranking of ‘conservation entry points’, the workshop participants spent time brainstorming different roles that may be appropriate for TNC to play within the power sector planning space, given the organization’s mission, experience, and skill set.

The options identified by the workshop participants can be grouped as follows:

<u>*Elevating the issue of siting*</u>*:* The group acknowledged that siting was not a top-of-mind concern for power sector planners, or the renewable energy sector at large. Thoughtful leadership to educate the public on the consequences of poor siting, or alternatively the potential gains from low-impact siting, could help ameliorate this. Furthermore, identifying and promoting common policy pathways to help achieve low-impact siting objective would be useful, as would mapping least-conflict pathways for renewable energy development and using international forums to maximize idea exchange. Lastly, given

the fast-moving pace of energy sector change, the group noted the need for TNC to stay 'cutting-edge' in terms of new trends (e.g. offshore wind, storage) so as to stay continually relevant.

Promoting best-practice planning processes: It was noted that the US IRP requirements for utilities naturally create a variety of useful entry points for civil society participation (including conservation interests), as well as promote transparency that should naturally over time favor least-cost renewable technologies. Therefore, the workshop participants identified promoting modern power sector planning & IRP processes as a potential role for TNC, so long as it serves low-impact development outcomes and can yield material conservation outcomes. Alternatively, TNC could start engaging in projects that embrace IRP principles, which could subsequently aim to inspire a formalized regulated IRP requirement.

Promote dialogue and transparency within planning processes: Within an existing power planning process, a clear role was identified for TNC in helping to highlight the practical tradeoffs implied by different scenarios to promote participatory dialogue among stakeholders. In such processes, it was noted that TNC should be augmenting and facilitating existing processes, and that TNC needs to ensure that it interfaces with agencies by speaking to them with the language they are used to and from a perspective they care about. It was further emphasized that TNC's technical role would be a narrow one, within a larger existing set of technical expertise in capacity expansion analysis and planning, and that we don't need to replicate those existing functions but that we do need to understand them. Lastly, it was emphasized that we should be encouraging free and open-source software as part of those planning processes, as it increases the likelihood of stakeholders being able to review assumptions and creating positive feedback loops while evaluating those assumptions.

Adjacent but related to this, TNC's traditional role in convening was viewed as a clear asset, as the potential exists for us to help bridge the gap between local communities and government agencies via a stakeholder engagement process that may not happen otherwise. To accomplish this, it was suggested that TNC could (1) identify communities that are at greatest risk due to or might benefit from infrastructure & energy development, (2) inform those communities of the potential development, (3) gauge the community's interest in being part of the planning process, and (4) provide capacity to help them engage in the process. Furthermore, TNC could provide capacity to (a) work with communities to identify their existing values which might be affected by development, then (b) involve the communities in developing representative metrics which represent those values, and lastly (c) show communities the way in which those metrics are affected by different development scenarios.

Generate a monitoring framework: There was group alignment that creating a 'watchdog' function for monitoring the implementation of planning processes, to measure the ensuing social and environmental impacts, would create a useful 'check' on the system. Such a watchdog function should engage with grassroots organizations with close ties to on-the-ground efforts.

Beyond planning: A variety of activity sets were identified that could further ensure the avoidance of environmental and social impacts in infrastructure development. For example, participants advocated that policymakers, financiers, and developers be approached to create siting guidelines. Furthermore, there was group agreement that additional research would be useful to link how lower environmental and social impact reduces risk. The discussion concluded with a consensus that planning only goes so far – indeed that it is only one aspect of the energy sector, of which multiple aspects need to be addressed to ensure best-practice participatory siting outcomes, and that therefore these different aspects need to be worked on simultaneously rather than working solely on planning.

Appendix I: Key definitions

These definitions are provided for the purposes of facilitating group discussion; note that the definitions are open to comment / improvement / expansion.

- Community-based conservation: Conservation that strengthens the voice, choice, and action of indigenous peoples and local communities to shape and manage land and waters in ways that improve peoples' lives and drives biodiversity outcomes.[iii]
- Indigenous communities: A "community" refers to a well-defined group that self-identifies as a people and that has a shared identity, culture and/or values. The term "indigenous and local communities" to refer to communities that possess a close and profound relationship with their natural landscapes (territory, area or habitat) which they depend on for cultural, religious, health and economic needs. This includes the original inhabitants of a place and/or migrants who have settled in a place who have the aforementioned relationship with the natural landscape. Note that indigenous peoples and indigenous communities are usually original inhabitants of a place and thus consider themselves distinct from other sectors of the societies now prevailing in the territories, which they [indigenous peoples] originally occupied prior to colonization. Indigenous peoples have collective rights recognized under international law.[iv]
- Integrated Resources Planning: A plan for meeting forecasted annual peak and energy demand, plus established reserve margin, through a combination of supply-side and demand-side resources over a specified future period (usually 10-20 years). It is designed as a comprehensive decision-support tool and road map for meeting a utility's goals of reliable and low-cost electricity while mitigating risks. Steps taken in the creation of an IRP include: (1) forecasting future loads (2) identifying potential resource options to meet those future loads, (3) determining optimal mix of resources based on goal of minimizing future costs, (4) receiving and responding to public participation (where applicable, eg from customers, advocacy groups, and project developers), and (5) creating and implementing the resource plan. IRPs are reviewed by state public utilities commissions, and are updated on a regular basis (e.g. every 2-3 years) as informed by state legislation or regulation. IRPs differ from traditional planning in that it requires the use of analytical tools to fairly consider both demand and supply-side resources. Currently 33 states require utilities to file IRPs for review by state public utilities commissions. "*For an IRP process to be deemed successful, it should include both a meaningful stakeholder process and oversight from an engaged public utilities commission".*[v]
- Power system planning: Form of energy and economic development planning that provides a minimum cost strategy for long-range expansion of the generation, transmission and distribution systems adequate to supply the load forecast within a set of technical, economic and political constraints.[vi] Note that IRPs are a form of power system planning.
- Supply reliability: Hydro-dominated countries (e.g. Brazil) were historically energy-constrained, that is, supply shortages resulted from lack of water in the reservoirs, and the consequences were energy rationings that could last several months. In contrast, thermal-dominated countries such as the UK were peak-constrained, with supply interruptions resulting from the combination of equipment outages and peak demand and, therefore, lasting hours. Renewables and, in the case of hydro countries, gas-fired generation, have changed this situation; many countries are

now both energy and peak-constrained. This means that it is necessary to have two supply reliability criteria, related to energy and peak shortages, respectively. The energy reliability criterion is usually enforced implicitly through the penalties for energy rationing in the system operation module such that “total firm energy is higher than total annual energy consumption with a margin”. The peak reliability criterion can also be ensured through a similar “total firm peak capacity must be greater than annual peak load plus a margin” constraint. Alternatively, one can have an explicit representation of the supply reliability criterion.

Appendix II: Technical notes on distinctions between solar, wind and hydropower resources

Below are a series of technical considerations to bear in mind when evaluating solar, wind and hydropower candidate sites as part of the capacity expansion planning process:

- Candidate site availability for dam site development are fewer than for wind and solar – and a large proportion of the best sites for large dams have already been developed in most of the world.
- Hydropower projects tend to have much longer project delays and greater cost overruns than solar and wind installations.
- Hydropower projects tend to be capital intensive, which limits the range of possible developers.
- Hydropower is not modular, as solar or wind, and the long construction time of some projects is a source of uncertainty. A large hydro because that requires 5-7 years to start operation may be justified on the ground of an expected load growth; this may be a problem if economy slows down during this period. Wind and solar are developed quickly (<1 year) and may be developed as needed.
- Hydropower impacts tend to be greater in scope – including distant impacts from alterations to downstream flow, nutrient, and sediment regimes, which can impact downstream riverine, floodplain, and delta environments, and the biodiversity and ecosystem services dependent on them. In addition, it has been estimated that 5-10 times more people are affected downstream than from dam project sites and reservoirs.
- Dam projects can affect the performance of other dam projects, and collectively, they can have additive and/or synergistic downstream impacts to people and nature. Upstream dam locations and operations can affect downstream dam locations and operations, so planning through integrating alternative combinations of sites and operations in scenario analyses is critical to assess generation potential, financial performance, and social and environmental impacts.
- Dams are often developed in remote, low population areas, solar and wind can be developed within high population (e.g. distributed solar).
- The project development lifecycle, including financing and licensing, is less time-consuming/burdensome for wind and solar than for hydro development.
- Wind and solar are variable sources of energy, hydropower can provide firm energy through reservoir operations and is “dispatchable”.
- Since hydropower is dependent on a reliable supply of water, this generation capacity is exceptionally vulnerable to climate change (e.g., altered stream flow due to periods of drought and floods reduce power generation).
- Large hydropower development will detrimentally impact rivers that cross country borders. This can increase regional tensions and conflicts over the use of limited natural resources.

Endnotes

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[i] "Battery Power's Latest Plunge in Costs Threatens Coal, Gas". Bloomberg Energy Finance, March 26 2019. https://about.bnef.com/blog/battery-powers-latest-plunge-costs-threatens-coal-gas/

[ii] Utilities have always had to plan ahead for their investments. Over the years, however, this process has become increasingly complicated. Historically, utilities mainly considered generation, transmission, and distribution additions to meet growing demand; now they have to plan for a more complex and uncertain environment. This includes power purchase agreements from independent power producers, upgrades to aging and vulnerable transmission and distribution infrastructure, and the growth in customer-sited distributed energy resources. Utilities must also bear in mind a variety of factors which have been magnified in this energy landscape: base load versus peaking power, environmental externalities, resource diversity, and volatility in the fuel and commodities markets and their subsequent effects on price stability, and reliability. For further information, see definition in Appendix I as well as this link.

[iii] TNC, 2018, What is Freshwater Community-Based Conservation?
[iv] TNC, 2018, What is Freshwater Community-Based Conservation?
[v] Rachel Wilson and Bruce Biewald. "Best Practices in Electric Utility Integrated Resource Planning: Examples of State Regulations and Recent Utility Plans." Prepared by Synapse Energy Economics for the Regulatory Assistance Project, June 2013. https://www.raponline.org/wp-content/uploads/2016/05/rapsynapse-wilsonbiewald-bestpracticesinirp-2013-jun-21.pdf
[vi] A.J. Covarrubias. "Expansion Planning for Eletric Power Systems". IAEA Bulletin Vol 21, No 2/3. https://www.iaea.org/sites/default/files/212_304985564.pdf