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REGIONAL-CAPACITY DEVELOPMENT TECHNICAL ASSISTANCE (R-CDTA)

STRENGTHENING KNOWLEDGE MANAGEMENT IN CENTRAL AND WEST ASIA

PROMOTING GOOD JOBS AND INCLUSIVE GROWTH THROUGH ENERGY PROJECTS IN CENTRAL AND WEST ASIA

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TABLE OF CONTENTS

Appendices

Appendix Tables

Appendix Figures

Tables

Figures

Boxes

Table of Abbreviations

CAREC	Central Asia Regional Energy Cooperation
CIM	Construction, installation and manufacture
CTF	Clean Technology Fund
CWA	Central and West Asia
DMF	Design and Monitoring Framework
FDI	Foreign Direct Investment
GHG	Greenhouse Gas
GDP	Gross Domestic Product
HDI	Human Development Index
IFI	International Financial Institutions
ILO	International Labor Organization
IO	Input-Output
LFA	Logical Framework Approach
MDB	Multilateral development banks
MW	Megawatt
O&M	Operation and maintenance
PPP	Public Private Partnerships
PV	Photovoltaic
PFBP	Poverty Family Benefit Program
RE	Renewable Energy
SAM	Social Accounting Matrix
SCADA	Supervisory control and data acquisition
TA	Technical Assistance

Executive Summary

1. The Asian Development Bank (ADB) has been heavily involved in energy infrastructure interventions in the Central and West Asia (CWA) region.[1] The energy sectors of these countries are characterized by aging and inefficient infrastructure built during the former Soviet era. Despite high electrification rates, service quality is low and there is inadequate access to clean modern energy for heating and cooking. Electricity is generally affordable in the region, but tariffs are typically set below cost-recovery levels. Some of the countries in the region also lack sufficient generating capacity to meet demand, especially during winter months. ADB's work in the region has focused on improving access and quality for consumers, increasing efficiency and modernizing existing utilities, adding technical and institutional capacity in generation, transmission and distribution, and facilitating cooperation in the region.

2. ADB's work has clearly helped improve conditions in the energy sector and for energy consumers, but ADB also strives to achieve broader developmental impacts with its interventions. ADB's Strategy 2020 focusses on fostering inclusive economic growth, environmentally sustainable growth, and regional integration. The topic of inclusive economic growth reflects a growing concern among multilateral development banks (MDBs) and other international organizations that, where economic growth has occurred in the region, it has been driven by oil and gas exports, and remittances from major oil and gas exporters (primarily, Russia). A related concern is that the jobs being created are short-term jobs only, such as construction, or unskilled service sector jobs. The objective of creating "good jobs" has therefore also entered the agendas of some MDBs and international organizations.

3. The definitions of the terms "inclusive growth" and "good jobs" vary considerably between the organizations that use them. This paper uses the term inclusive growth to mean rapid and sustainable economic growth whose fruits are broadly shared among the population. It uses the term good jobs to mean jobs that are well-paid, secure, and safe.

4. The paper analyzes the links between energy service provision, good jobs, and inclusive growth. The purpose of this analysis is to offer advice to ADB, other MDBs, and MDB borrowers that will help—if inclusive growth and good jobs are the objectives—to design and implement energy sector interventions that achieve these objectives, and to measure progress against the objectives. In doing so, the paper also sets out a standard framework for evaluating the outcomes and impacts of energy sector interventions.

Developing a theory of change

5. Theory-based evaluation provides a framework for examining the relationship between energy sector interventions and good jobs/inclusive growth. Theory-based evaluation is a method of testing a theory of change (i.e. how the intervention is expected to lead to certain results) against the evidence of actual results, to determine if the intervention contributed to these results in the expected way. The theory of change used in this paper mimics the structure of ADB's standard Design and Monitoring Framework (DMF), beginning with outputs, which lead to outcomes, and later to impacts. Outputs include project deliverables, which we have categorized as technical, regulatory reform, commercial reform, and institutional development. Outcomes include direct effects of these outputs, such as improved service quality, cost, access, or adequacy to meet demand, along with operational and commercial efficiency. Impacts, including good job creation and inclusive growth, are the long-term development results of these outcomes.

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[1] The CWA region includes Armenia, Azerbaijan, Georgia, Kazakhstan, the Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan.

6. Impacts are further differentiated to describe the various mechanisms by which jobs are created (for example, jobs created directly for the project or through various trickle-down effects) and how it is ensured that those jobs are "good" (i.e. through situation-specific planning and positive external influences in the region). We also describe the mechanisms that make growth "inclusive". These mechanisms include improvements to businesses owned by the poor, provision of job opportunities to disadvantaged populations, and increased quality of life through energy access for the poor.

Testing the theory of change

7. We tested the theory of change by researching evidence of energy sector interventions that led to job creation, good job creation, growth, and inclusive growth. The evidence for job creation is strong. Jobs created for the purpose of construction, installation and manufacture, or operation and maintenance of the energy infrastructure varies by technology, but can range from 2 job years/Megawatt (MW) for gas plants to 32 job years/MW for small hydro plants, according to an OECD study. Estimates are thought to be even higher for non-OECD Asia.[2] Job creation also happens as businesses gain better access to reliable, good quality energy supply. This type of job creation or growth is sometimes referred to as "second-order" growth effects. There is no direct evidence of the second-order impact, but reliable energy access through small generator use has been linked, in some studies, to employment growth in low and lower-middle income countries which experience substantial outages. It is therefore reasonable to argue that reliable grid connections would result in equal if not greater employment effects.

8. We analyzed whether the jobs created were "good" by looking for evidence that they were well-paid, which is a key attribute of good jobs and is also the most easily measured. We found evidence that electricity supply, construction, and manufacturing jobs in the region typically have higher average monthly earnings than the total labor force.[3] Second-order growth effects have also been shown to create good jobs, as electrification has been shown to increase incomes of cottage industries in Asia.[4] More generally, it is possible to link energy access to good job creation due to findings that the Energy Development Index (comprised of several energy access indicators) is strongly correlated with per capita income. [5]

9. The evidence linking energy sector interventions to economic growth, however, is surprisingly limited, and thus it is difficult to link these interventions to inclusive growth. Energy use and GDP trend loosely together in CWA countries, but there are instances in which GDP increases as energy use decreases, as is the case in Uzbekistan and for some years in Tajikistan and Azerbaijan. Likewise, the relationship between energy use and the Human Development Index (HDI, an alternative growth measure incorporating life expectancy, education, and Gross National Income indexes), shows similar, sometimes counterintuitive trends. In analyzing the inclusivity of growth, we turned to the Gini index, a measure of income inequality. We would expect to see that as energy use increases in CWA countries, the Gini coefficient decreases, indicating better income equality. This relationship appears—in a simple, visual comparison—to hold in some instances, but not always. Macro-level indicators such as GDP, HDI, and the Gini index are too high-level to offer much insight on the links between them and energy use. Moreover, any causality that could be observed is likely to be bidirectional, with energy use promoting growth and

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2 Rutovitz, Jay, E. Dominish, and J. Downes. "Calculating global energy sector jobs: 2015 methodology." (2015).

3 DHInfrastructure analysis of "Mean nominal monthly earnings" as recorded in the ILOSTAT Database

4 Pachauri, Shonali, Narasimha Rao, Yu Nagai, and Keywan Riahi. "Access to modern energy: Assessment and outlook for developing and emerging regions." Laxenburg: IIASA (2012).

5 Pachauri, Shonali, Narasimha Rao, Yu Nagai, and Keywan Riahi. "Access to modern energy: Assessment and outlook for developing and emerging regions." Laxenburg: IIASA (2012).

growth promoting energy use. No evidence, therefore, allows us to conclude that energy sector interventions cause inclusive growth.

The Gaps between Theory and Practice and How to Bridge Them

10. A review of MDB energy sector interventions reveals some instructive lessons on the gap between the theory of change and the evidence, and how to bridge that gap. Jobs that created aren't necessarily "good", growth is not always inclusive, and expectations may be poorly aligned with project design and implementation.

11. Jobs created may not be "good" because the limited duration of energy interventions can impact the stability of jobs, unless the project life is long or there is a means to sustain the work or apply the job skills elsewhere after the project is complete. Electricity generation infrastructure can take two to six years to complete, which limits the life of construction installation and manufacturing jobs.[67] As suggested in ADB's 2015 Development Effectiveness Review, one way to ensure job stability is through the implementation of cost-recovery tariffs, which allow for adequate budgets to operate and maintain an asset after it has been built.[8] Safety is also a concern, particularly for construction jobs. While the MDBs do work to mitigate safety risks and hold projects to internationally accepted standards, The International Labor Organization has identified decent work deficits in the energy sector. These deficits include non-standard employment, lack of adequate social protection, and prevalence of accidents.[9]

12. Jobs created from energy interventions are also not always inclusive, and can disproportionately benefit men and the non-poor or exclude domestic labor. Women in the region sometimes face different education opportunities, labor norms, or social roles, leading to their exclusion from the types of jobs energy infrastructure projects help to create. Some ADB projects promote inclusivity for women by earmarking a percentage of jobs which should be allocated to women, or including a social and gender expert to ensure the proper implementation of gender activities. In countries where women have less access to infrastructure jobs due to social rules or safety issues, simultaneous projects focused directly on gender inclusion would be complementary. Inadequacies in education can also be a barrier to the rural poor, or to domestic labor overall, particularly in terms of skilled job creation. Domestic workers may be excluded from manufacturing jobs, depending on the manufacturing capacity within the country, the type of project (generation, transmission or distribution) and the complexity of the energy technology being used. It was estimated in 2010 that only 30 percent of manufacturing for RE technologies in Non-OECD Asian countries is undertaken in the region.[10] Active labor market interventions can also be used to allow workers to gain new skills.[11] ADB's Social Protection Strategy includes skills development programs, among other active labor market programs.[12]

13. Sometimes energy interventions can work against inclusivity. For example, there may be a mismatch in new job skills with those of older technologies. This mismatch is particularly common with RE technologies, in which the unskilled labor of previous

6 This is a US-based estimate, and the actual range in the region may be longer, and may vary by country.

7 U.S. Energy Information Administration, "Cost and Performance Characteristics of New Generating Technologies, Annual Energy Outlook 2016," (2016).

8 ADB, "2015 Development Effectiveness Review," (2016).

9 International Labour Organization, "Global Dialogue Forum on Good Practices and Challenges in Promoting Decent Work in Construction and Infrastructure Projects," (2015).

10 Rutovitz, Jay, E. Dominish, and J. Downes. "Calculating global energy sector jobs: 2015 methodology." (2015).

11 Lucas, Hugo, and R. Ferroukhi. "Renewable Energy Jobs: Status, Prospects & Policies, Biofuels and grid-connected electricity generation," *IRENA* (2011).

12 ADB, "Our Framework Policies and Strategies: Social Protection," (2003). http://www.adb.org/sites/default/files/institutional-document/32100/social-protection.pdf.

technologies cannot be used to fill the new skilled labor positions required. In such cases, a skills mapping can help to identify matching skills and skills gaps. This mapping can serve as the basis for training and education programs where skills are lacking, and as a guide for providing jobs in areas where skills are strong. It is also beneficial to provide services which match workers to appropriate jobs, and to focus job creation on areas where there is currently low employment.[13] Energy interventions may also work against inclusivity by creating problems with affordability for the poor. While affordability is not currently a problem in the region, tariffs are well below cost-recovery and will need to be raised to ensure long-term financial stability of energy service providers. Higher tariffs always mean affordability risks for the poorest energy consumers, and these risks will need to be addressed. We recommend carefully targeted subsidies for the poor if it is found that tariff increases will not allow a segment of the population to meet their basic needs. Direct cash benefits or energy coupons, targeted in the same way as food or education benefits, may be a good option, if logistically possible. This type of subsidy allows the poor to afford the energy they need, without encouraging overuse by the non-poor (as a lifeline tariff might). Connection fees which are paid in installments or incorporated into the tariff can also make connections more affordable for those without the ability to pay a large sum up-front. Payment schedules should also reflect the variability and seasonality of the population's income sources, particularly for rural agricultural workers.

14. A more prevalent reason for the gap between objectives and impacts is a problem of unrealistic expectations. Good jobs and inclusive growth are sometimes treated as add-on concepts, meaning that the project design may not include specific mechanisms for achieving these impacts, although they are included in the DMF. However, these impacts do not happen on accident. It is therefore important that the project design reflects these impacts in a deliberate way, and that the DMF includes performance indicators to measure progress toward these impacts whenever possible. However, there is also a question as to whether it is appropriate to expect a single project to measurably contribute to inclusive growth, as the effects of any single intervention on growth are likely to be too diffuse to measure. We suggest instead that it may be more reasonable to present inclusive growth as a long-term impact for which the individual intervention is expected to make a small (possibly immeasurable) contribution, while a larger sequencing of interventions is held accountable, as a whole, for achieving measurable progress.

Measuring impacts

15. There does appear to be a logically defensible theory of change linking energy interventions to good job and inclusive growth impacts, but the evidence thus far is scarce. It is therefore important to be able to measure these impacts, which can be included as performance indicators in ADB's DMFs. The definition of clear indicators is important. Some of the indicators may be appropriate for use at a project level, while others are more relevant for assessing contributions of a sequencing of multiple projects. In addition, we acknowledge that adequate data are not always available, and that anecdotal evidence may be a good alternative in those cases. Below is a summary of some of the suggested indicators.

[13] Lucas, Hugo, and R. Ferroukhi. "Renewable Energy Jobs: Status, Prospects & Policies, Biofuels and grid-connected electricity generation," *IRENA* (2011).

Table 0.1: Indicators for Measuring Jobs, Good Jobs, Growth and Inclusive Growth

Impact	Indicator	Data Source
Job Creation	▪ Number of jobs created ▪ Number of jobs (or job years) created per MW	Project records Input-Output (IO) table Social Accounting Matrix (SAM)
Good Job Creation	▪ Average wage on the project compared to baseline of national average wage ▪ Days of work missed due to injuries on the job ▪ Ratio of skilled to unskilled jobs ▪ Change in the percent of the population below the poverty line ▪ Change in the percent of vulnerable employment	Project Data Census data World Bank Development Indicators
Growth	▪ Change in GDP ▪ Change in HDI ▪ Change in value lost due to electrical outages ▪ Labor productivity per hour worked or per person employed	The World Bank Open Data United Nations Development Programme The Conference Board Total Economy Database
Inclusive Growth	▪ Change in Gini coefficient ▪ Percent of jobs allocated to women ▪ Percent of jobs allocated to unskilled workers (both unskilled jobs and skilled jobs with training) ▪ Percent of the project's domestic goods/services providers owned by a member of a disadvantaged group (i.e. woman, rural business owner, etc.)	The World Bank Open Data Project data Census data

1 Introduction

1. Countries in the Central and West Asia (CWA) region (which include Armenia, Azerbaijan, Georgia, Kazakhstan, the Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan) have experienced a mixed record of economic growth since the dissolution of the Soviet Union in 1991.[14] Several years of precipitous economic decline accompanied the collapse of the Soviet economy in each of the member states. Market reforms helped GDP growth recover in the mid-1990s and early 2000s, and most countries in the region experienced continued economic growth throughout the first decade of this century. Weakening oil and gas prices, and depreciating currencies have created economic vulnerabilities in many of the countries in recent years.[15]

2. The agendas of multilateral development banks (MDBs) and other international agencies have in recent years come to reflect a growing perception that, where economic growth has occurred in the region, it has been driven by oil and gas exports, and remittances from major oil and gas exporters (primarily, Russia); and that the jobs being created are short-term jobs only, such as construction, or unskilled service sector jobs. Linked to this perception is the view that the economic growth taking place has primarily benefitted privileged groups and not contributed substantially to the reduction of poverty or broader distribution of wealth.

3. Indeed, there is some evidence that, in the CWA region, this perception is accurate. Whereas GDP in the region has increased, progress toward income equality has been mixed. According to the International Labor Organization (ILO), employment growth has not matched the consistent growth in GDP. Employment rates in the region are substantially lower than the global average (52.9 and 59.2 percent respectively in 2015), and regional unemployment is expected to rise to 9.4 percent in 2016.[16]

4. Income equality (as measured by the Gini coefficient) has shown varying trends throughout the former Soviet Republics; sustained economic growth has not always brought a more even distribution of wealth. Gender, spatial, and age inequality are also evident. In many countries, there is lower labor force participation for females and higher unemployment rates. Additionally, there are disparities in poverty rates between urban and rural regions and inequalities in unemployment rates for youths. The context for each country is different, and the extent of these disparities varies, but it is apparent that the region as a whole has experienced growth with less than desirable impacts for poverty and equity.

Energy, jobs and growth

5. The energy sector is often viewed as one of the best engines for economic growth. This view is understandable, and substantiated, in energy exporting countries like Kazakhstan, Azerbaijan, and Uzbekistan. The view also holds, however, for resource poor, energy importing countries like Armenia or Kyrgyzstan. Access to reliable, good quality, affordable energy—the argument goes—lets people engage in more productive activities, is the backbone for means of modern communication, and satisfies needs which ultimately improve standards of living. The Global Energy Assessment, which combines the research of over 300 authors from academia, business, government, intergovernmental and non-governmental organizations from around the world, states that "Access to modern forms of energy is essential to overcome poverty, promote economic

[14] ADB's definition of the CWA region typically includes Pakistan and Afghanistan, but in this paper we have included only the countries listed due to their shared social, political and economic histories.

[15] ADB, "Good Jobs for Inclusive Growth in Central and West Asia," (2016), http://www.adb.org/news/events/good-jobs-inclusive-growth-central-and-west-asia.

[16] ILO, "World Employment Social Outlook, Trends 2016," (2016).

growth and employment opportunities, support the provision of social services, and, in general, promote sustainable human development."[17]

6. Much less has been said, however, about the type of economic growth promoted by access to reliable, good quality, affordable energy. Does it create jobs? Are the jobs the types of jobs that create long-term, sustainable growth? Does the growth have any effect on income distribution?

Inclusive growth and good jobs

7. Preoccupations with the promotion of income equality, and the types of jobs available, are not unique to the CWA region. Variations on these themes have been hot topics in many countries since the global financial crisis of 2007-2009. They remain hot topics today in developing, transition, and developed economies.

8. The same preoccupations are echoed by trends in economic development circles to prioritize "inclusive growth", and creation of "good jobs". These buzzwords are not always well defined,[18] but they take root in a collection of sentiments that economic growth alone is not enough, or that traditional definitions of "growth" are inadequate.

Purpose of this paper

9. This paper analyzes the links between energy service provision, good jobs, and inclusive growth. The purpose of this analysis is to offer advice to ADB, other MDBs, and MDB borrowers that will help—if inclusive growth and good jobs are the objectives—to design and implement energy sector interventions that achieve these objectives, and to measure progress against the objectives. The analysis is based on a review of existing literature on good jobs and inclusive growth, review of ADB publications and project documents in the region, and interviews with ADB staff on their observations of energy sector project impacts, and their experiences with evaluating good job and inclusive growth impacts (Interview questions are listed in Appendix D).

10. Definitions of good jobs and inclusive growth vary, but in this paper we will define good jobs as jobs that are well-paid, secure and safe. However, this definition does vary based on perspective. A good job from the perspective of a worker is well-paid, has potential for earnings growth, and provides a high level of satisfaction. Good jobs from a macro perspective are those with high-productivity, high productive externalities, and potential for productivity growth.[19] While good jobs in general are an essential component of economic growth, they are not necessarily accessible to the poor, due to inadequate education and skills, or location of the jobs. The poor more typically have access to informal jobs that lack stability and social protections (these are not considered good jobs). Inclusive growth requires good jobs which are accessible to the poor. We will define inclusive growth as "rapid and sustainable economic growth whose fruits are broadly shared among the population".[20] We draw these definitions from a collection of definitions or descriptions found in literature from the International Financial Institutions (IFIs) and bilateral donor agencies.[21] A selection of these definitions or descriptions can be found in Appendix A.

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[17] Karekezi, S., S. McDade, B. Boardman, and J. Kimani. "Energy, poverty, and development." Global Energy Assessment–Toward a Sustainable Future (Cambridge University Press, 2013) (2012): 151-190.

[18] Roopanarine, Les. "Development jargon decoded: inclusive growth," October 3, 2013. https://www.theguardian.com/global-development/poverty-matters/2013/oct/03/development-jargon-decoded-inclusive-growth.

[19] Javorcik, Beata. 2012. Does FDI Bring Good Jobs to Host Countries?. Background Paper for the World Development Report 2013;. World Bank, Washington, DC. © World Bank. https://openknowledge.worldbank.org/handle/10986/12132

[20] ADB, "Good Jobs for Inclusive Growth in Central and West Asia," (2016).

[21] The International Financial Institutions (IFIs) include the World Bank, the Asian Development Bank, other regional development banks, and the International Monetary Fund (IMF).

11. We begin, in Sections 2 and 3, by proposing a conceptual framework which illustrates how energy sector projects could be designed to contribute to the creation of good jobs and inclusive growth. We use this framework in Sections 4 and 5 to analyze whether there is evidence that supports the notion that energy sector projects can lead to good jobs and inclusive growth. In Sections 6 and 7 we recommend additional steps necessary to better ensure that future projects are able to promote good job creation and inclusive growth, and to better measure the links between energy sector projects, good jobs, and inclusive growth.

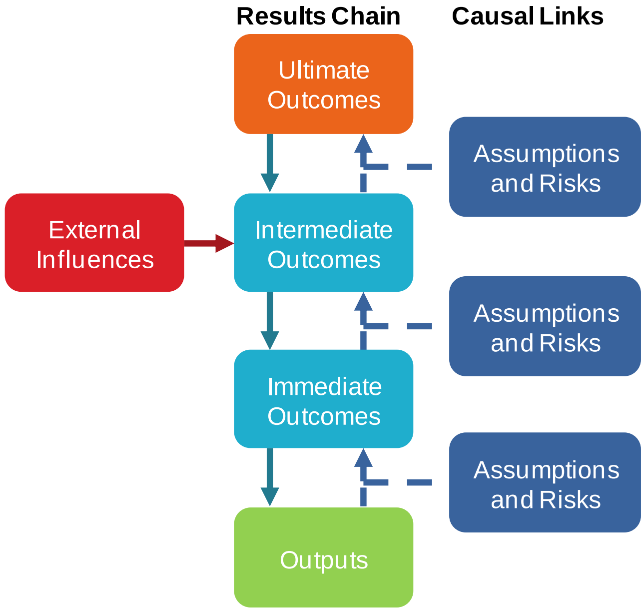
2 A Framework for Analysis

12. The field of program evaluation offers frameworks that are well suited to analyzing the links between energy service provision, good jobs and inclusive growth.

13. Program evaluations came about in the US in the late 1950s, primarily to assess publicly-funded educational programs. In the 1960s, concern that investments in social and educational programs would be misspent led to the inclusion of evaluation requirements as a standard part of federal grants.[22] Program evaluations have since been used increasingly to evaluate policies, programs and projects (we will use the term "intervention" generically throughout the remainder of the text) financed by multilateral lending banks and bilateral development aid agencies.)

14. A conceptual approach commonly used in program evaluations is the Logical Framework Approach (LFA), in which the components of the project are presented in a systematic table showing inputs, program activities, intended achievements, potential problems, and indicators to measure the success of the project.[23] A "logframe" graphic or table is often developed as part of an LFA to illustrate the links between the outputs, immediate outcomes, intermediate outcomes, and ultimate outcomes, which are likely to result from the intervention. These events are connected through causal links, and affected by assumptions, risks, and external influences (See Figure 2.1 for an example of a generic logframe).

Figure 2.1: Generic Logframe



Source: Adapted from Treasury Board of Canada Secretariat, "Theory-Based Approaches to Evaluation: Concepts and Practices," (2012).

15. ADB uses the LFA in the form of the Design and Monitoring Framework (DMF) developed at the start of each project to track project outputs, outcomes and impacts.[24] Outputs are project activities (for example, rehabilitation of a generation plant); outcomes

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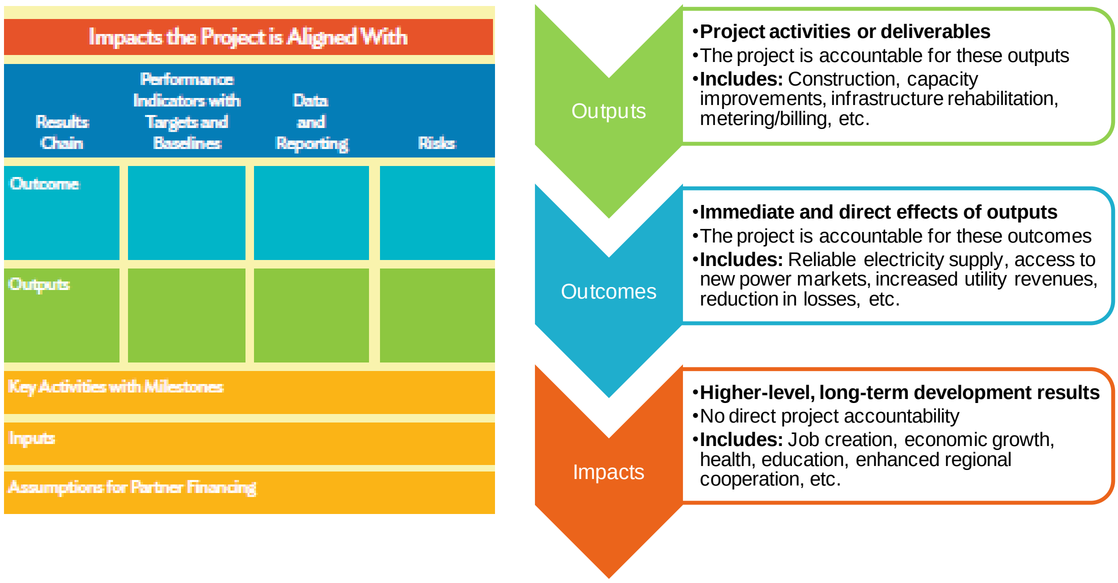
[22] Baker, Anita. "Participatory Evaluation Essentials: History of Evaluation," Evaluation Services. (2005). http://www.evaluativethinking.org/docs/SEC_Session1/HistoryofEvaluation.pdf.

[23] BOND, "Logical Framework Analysis," (2003). http://www.gdrc.org/ngo/logical-fa.pdf.

[24] The LFA was developed by Loen J. Rosenberg in 1969 for the United States Agency for International Development, which first utilized the approach in 1970. It has since gained acceptance as a design, monitoring, and evaluation methodology, and is widely used by multilateral donor organizations, including AECID, GIZ, SIDA, DFID, SDC, UNDP, EC, and IADB.

are the immediate results of those outputs (for example, a decrease in the number of power outages); and impacts are higher-level results that the outputs contribute to but are not necessarily fully accountable for (for example, economic growth). Figure 2.2 shows ADB's DMF template, with a description of outputs, outcomes, and impacts. Each component is color coded to match their counterparts in the generic log frame depicted in Figure 2.1.[25]

Figure 2.2: ADB Design and Monitoring Framework



Source: ADB, "Guidelines for preparing a design and monitoring framework," (2016).

16. Showing true causation between an intervention and its results, or "attribution" of results to an intervention, is the evaluator's task. Quantitative and qualitative methods can be used.

17. Methods commonly used to evaluate attribution include experiments and quasi-experiments. Contribution is typically evaluated using quasi-experiments, case studies, correlation studies, longitudinal studies, natural experiments, and/or sample surveys.[26] Proving attribution involves rigorous experiments and statistically significant quantitative data, but the methods involved in proving contribution can be qualitative, or a mix of quantitative and qualitative. Qualitative methods can include key informant interviews, focus groups, open-ended survey questions, case studies, field notes, etc. While quantitative methods are more rigorous, and therefore more widely accepted in proving intervention effectiveness, these methods often do not provide enough depth to fully interpret the findings.[27] These methods can also be costly. Qualitative methods can provide more detailed information, including how and why an outcome or impact occurred, but can also be time-consuming and yield results that are less reliable.[28]

18. Theory-based evaluation is a qualitative method for assessing the contributions of interventions in scenarios where experimental evaluations are difficult, costly, or unethical.

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25 Evaluators often differ slightly in the terminology they use in an LFA, especially in use of the term "impact". The example in Figure 2.1 used the term "ultimate outcome" for what ADB calls "impact".

26 Almquist, Anne. "Attribution Versus Contribution," CDC. (2011). http://www.cdc.gov/dhdsp/pubs/docs/april_2011_cb.pdf.

27 Prevention by Design, "Evaluation Methods Tip Sheet," (2006). http://socrates.berkeley.edu/~pbd/pdfs/Evaluation_Methods.pdf.

28 Prevention by Design, "Evaluation Methods Tip Sheet," (2006). http://socrates.berkeley.edu/~pbd/pdfs/Evaluation_Methods.pdf.

Unlike experimental evaluations, which use a counterfactual to assess the difference between a baseline and final result, theory-based evaluations use a theory of change to determine if and how the intervention contributed to the observed results. A theory of change, also called a results chain, is the process of how interventions can be expected to lead to certain results. The theory of change can be tested against what actually occurs, in order to assess whether the intervention contributed to the results in the expected way. This test not only looks at the influences of the intervention, but also at the influences of contextual factors which may have also contributed (positively or negatively) to the observed outcomes.[29]

19. Whereas rigorous attribution is not possible with theory-based evaluation, it may be possible to make a case for contribution. A method known as “contribution analysis” is sometimes used in theory-based evaluations. This type of analysis involves the development of a results chain, which is then tested against the evidence, and used to form a performance story (or an argument as to how the program being evaluated contributed to the observed outcomes). Box 1 shows a framework for “contribution analysis” that we propose to use as a framework for this paper.

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[29] Treasury Board of Canada Secretariat, “Theory-Based Approaches to Evaluation: Concepts and Practices,” (2012).

Box 1: Contribution Analysis

Step 1. Develop the results chain	Develop the program theory model/program logic/results chain describing how the program is supposed to work. Identify as well the main external factors at play that might account for the outcomes observed. This program theory should lead to plausible association between the activities of the program and the results sought. Some links in the results chain will be fairly well understood or accepted. Others will be less well understood or subject to explanations other than that the program was the “cause”. In this way you acknowledge that attribution is indeed a problem.
Step 2. Assess the existing evidence on results	The results chain should provide a good idea of which intended results (outputs, intermediate and end outcomes) could be measured. What evidence (information from performance measures and evaluations) is currently available on the occurrence of these various results? The links in the results chain also need to be assessed. Which are strong (good evidence available, strong link or wide acceptance) and which are weak (little evidence available, weak logic or little agreement among stakeholders)?
Step 3. Assess the alternative explanations	Outcomes by definition are influenced by the action of the program but also by external factors- other programs, as well as social and economic factors. In addition to assessing the existing evidence on results, there is a need to explicitly consider the extent of influence these external factors might have. Evidence or logical argument might suggest that some have only a small influence and that others may have a more significant influence on the intended results.
Step 4. Assemble the performance story	With this information you will be able to set out the performance story of why it is reasonable to assume that the actions of the program have contributed (in some fashion, which you may want to try and characterize) to the observed outcomes. How credible is the story? Do reasonable people agree with the story? Does the pattern of results observed validate the results’ chain? Where are the main weaknesses in the story? There always will be weaknesses. These point to where additional data or information would be useful In getting additional evidence it is not possible (at least for now), that this is the most you can say about the extent to which the program has made a difference.
Step 5 Seek out the additional evidence	To improve your performance story you will need additional evidence. This could involve information on both the extent of occurrence of both specific results in the results chain and the strength of certain links in the chain.
Step 6 Revise and strengthen the performance story	With the new evidence you should be able to build a more credible story, one that a reasonable person will be more likely to agree with. It will probably not be foolproof, but will be stronger and more credible.

Source: Mayne, John. “Addressing Attribution Through Contribution Analysis: Using Performance Measures Sensibly”, The Canadian Journal of Program Evaluation Vol. 16 No. 1 Canadian Evaluation Society, 2001

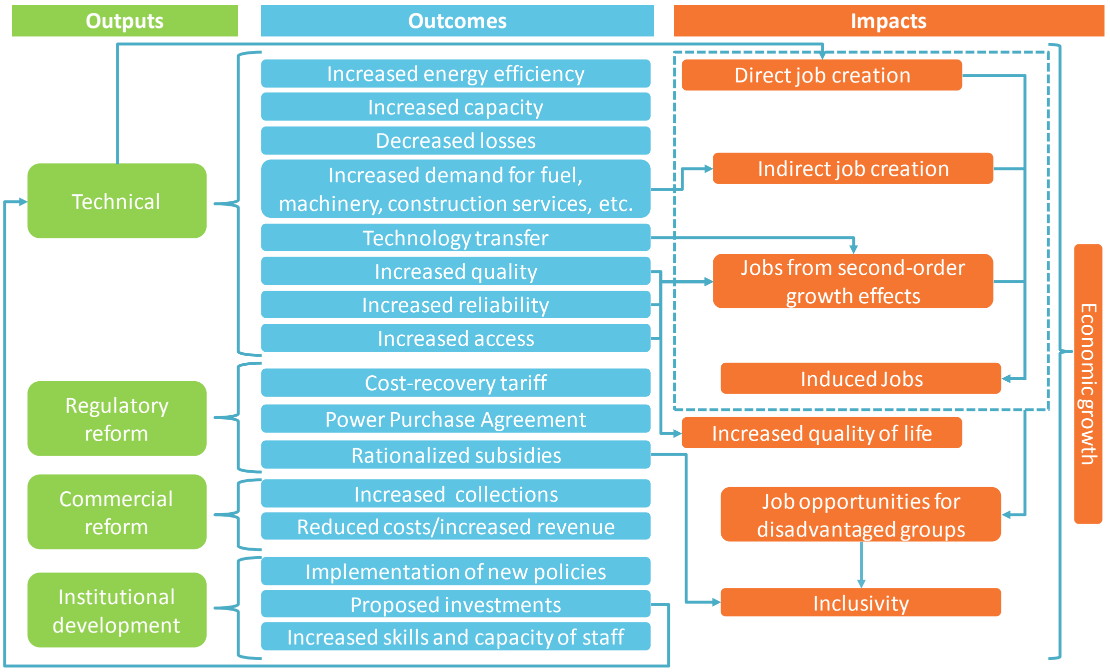
20. In the remaining sections of this paper we follow, roughly, the steps outlined in Box 1 to analyze the links between better energy service provision, good jobs and inclusive growth:

- In Section 3 we propose a results chain which leads from interventions our “outputs” in energy service provision to good jobs and inclusive growth as “impacts” (Step 1 of the contribution analysis)
- In Section 4 we test the existing results chain against the evidence available (Step 2 of the contribution analysis)
- In Section 5 we look at what evaluators typically call “confounding” or “intervening” factors. Confounding and intervening factors are factors, other than those shown in the results chain developed in Section 3, which may explain why results were achieved or not achieved (Step 3 of the contribution analysis). We conclude that, while the performance story is persuasive, the evidence is still quite weak and there are many confounding factors which make the results difficult to measure (Step 4 of the contribution analysis)
- In Section 5 we recommend on how IFI interventions could be designed to better create good jobs and achieve inclusive growth
- In Section 7, we recommend where to look for other evidence that could strengthen the performance story (Steps 5 and 6 of the contribution analysis).

3 What Can Energy Sector Interventions Achieve?

21. Figure 3.1 shows a proposed results chain or logframe for energy sector interventions in the CWA region. The subsections that follow describe the outputs, outcomes and impacts in the logframe in more detail, as well as the links between them.

Figure 3.1: Logframe for Energy Sector Interventions



22. The CWA region's energy sector is unique from that of other regions in many ways that are reflected in the logframe and the intended "performance story". The sector is dominated by state-owned utilities which have aging, inefficient, and often poorly maintained energy infrastructure, built during the former Soviet era. Electrification rates are high, and energy is generally affordable because tariffs are typically low (often below cost-recovery levels), but there are persistent problems with service quality and reliability. The region is unique in that it is the only one in the developing world where centralized district heating is a major means of energy supply. Where district heating is not available (for example, in rural Kyrgyzstan) access to clean, modern energy sources of heating remains an important challenge. Appendix B details these and other common characteristics of, and challenges for, the countries of the CWA region in their energy sectors.

3.1 Interventions and Outputs

23. There are typically four types of interventions by IFIs in the CWA:

1. **Technical.** This category of interventions includes new construction, or rehabilitation of generation, distribution, and/or transmission infrastructure.
2. **Regulatory reform.** This category of interventions includes sector restructuring, unbundling, privatization, licensing, or tariff and subsidy reform.
3. **Commercial reform.** This category of interventions includes improvements to the financial and operational management of energy service providers (energy utilities) through training and management reform.
4. **Institutional development.** This category of interventions includes the development of sector policies and investment plans, training for staff of the relevant line ministries, and assistance in regional integration.

24. Appendix A includes a summary of ADB's and institutions' activities in the region, by country.

3.2 Outcomes

25. The outputs described in Section 3.1 are typically expected to lead to at least one of a half dozen outcomes.

26. Energy supply systems are built to serve customers' needs. Interventions to improve such systems therefore are, or at least should be, designed to improve on things customers care about. Experience suggests that customers care primarily about:

- **Access to energy supply.** Access to energy supply can mean having access to a heating or electricity network, or having access to their own sources of heat or electricity (for example, solar home systems or cookstoves)
- **Adequacy of energy supply.** Access to energy supply does not always mean access to adequate supply. Energy service providers must have enough energy to meet customer consumption needs over time (typically expressed as a flow, for example, in MWh), and enough capacity to meet instantaneous customer demand (typically expressed as a stock, for example, in MW)
- **The cost of energy supply.** Customers care about the cost of energy supply as it relates to their income or their expenditure on other items. When customers care about the cost of energy supply relative to expenditure or income, they are typically said, in development economics circles, to be concerned about "affordability"
- **Service quality.** Service quality is typically viewed as having several components:
  - **Reliability of supply.** Reliability of supply (also sometimes referred to as continuity of supply) is characterized by the number and duration of interruptions in energy supply.
  - **Quality of supply.** For electricity service this is characterized by frequency, voltage magnitude and its variation (voltage dips, temporary or transient over-voltage), and harmonic distortion. The quality of electricity supply for alternating current is measured by the extent to which power supplied maintains or distorts the sinusoidal waveform characteristic of normal power supply. Distortions can cause equipment damage or outages, depending on their severity. In the heating sectors, quality of supply is characterized by the level of comfort provided to the customer. Quality can also encompass the cleanliness and safety on the energy supply.
  - **Commercial quality.** Commercial quality is characterized by the quality of relationships between a supplier and a consumer, and is also sometimes referred to as consumer service quality.

27. Customers can, however, be shortsighted in ways that may prevent them or others from having reliable, good quality, affordable energy supply in future years. Some interventions to improve energy systems therefore focus on improving the ability of the owner and operator of the system to provide a similar service, at a comparable cost, over a longer time period. Such interventions are typically aimed at improving or maintaining the financial condition of the service provider (so they can properly maintain and invest in the system), the condition of the service provider's assets, or the efficiency with which those assets operate. These interventions are typically aimed at improving:

- **Operational efficiency.** Improvements to operational efficiency may focus on the supply side (for example, improving the efficiency of a thermal generating plant) or the demand side (for example, financing building retrofits for residential energy consumers). Supply side interventions also often include, critically, the reduction of technical or non-technical losses in the transmission and distribution of energy

- **Commercial efficiency.** Improvements to commercial efficiency will seek to improve the ability of the utility to recover revenue or reduce costs. The outcomes of commercial efficiency improvements often include better revenue collection or a reduction in non-energy related costs.

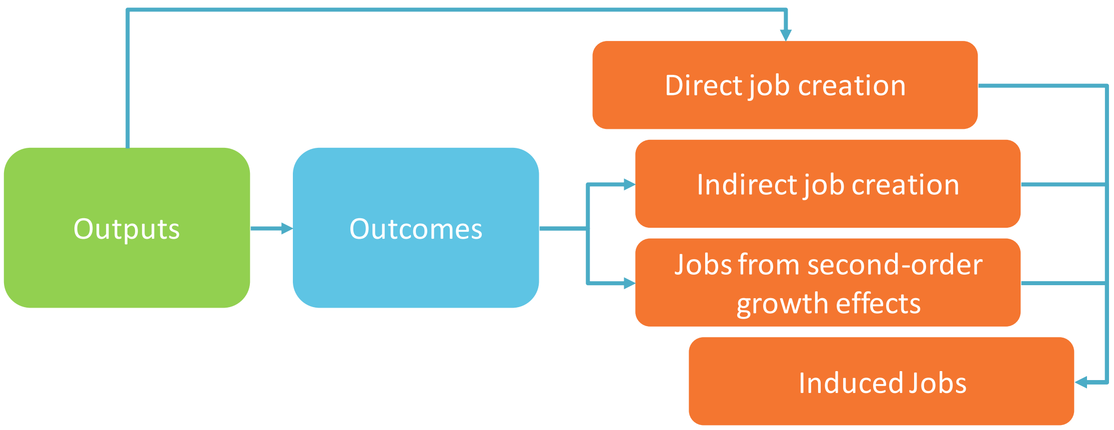
3.3 Impacts

28. The outcomes described above could have a variety of impacts related to job creation and economic growth, which in turn lead to "good job" creation and "inclusive growth" (given certain assumptions).

3.3.1 Job creation

29. The first of the impacts that we are interested in is job creation. New jobs could logically be created through several causal links. There is direct job creation from the construction and operation of the infrastructure projects and indirect job creation through use of other local inputs on the project. New jobs could also result from the increased access or improvement of energy supply (called second-order growth effects). Additional spending from workers holding these new direct, indirect, and second-order growth jobs could also lead to increased demand and new jobs in unrelated industries (induced jobs). Figure 3.2 depicts these causal links for job creation.

Figure 3.2: Causal Links for Job Creation



30. The following subsections describe the different types of job creation and their causal links in more detail.

Direct job creation

31. Direct job creation results from the manufacture, construction, and operation of the infrastructure asset created by the intervention (for example, a new power plant). This type of job creation is the easiest to observe and measure, but typically only represents a small piece of total job creation, as infrastructure projects generally create more indirect and induced jobs than direct jobs.

32. There are two types of direct jobs created through energy projects: jobs for the construction, installation and manufacture (CIM) of the project, and jobs for the operation and maintenance (O&M) of the infrastructure. CIM jobs last for the duration of the project's construction, while O&M jobs last for the duration of the infrastructure's life. The number and duration of CIM and O&M jobs depend on the project's technology and size.

Renewable energy technologies, for example, have been found in some studies to have longer CIM periods and shorter O&M periods when compared to fossil fuels.[30]

Indirect job creation

33. Energy infrastructure projects require services and inputs from other businesses, both in the construction and operation phase. Indirect job creation is caused by the expansion of existing businesses to serve the increased demand caused by the energy project. The demand for inputs, which results in demand for output and employment, is called a backward production linkage. For an electricity production project, for example, indirect jobs are typically created in the fuel, machinery, and construction services sectors, and in sectors which supply those sectors (for example, the suppliers of building materials to construction firms or the suppliers of housing to international workers during construction).[31]

Jobs from second-order growth effects

34. Limited access to energy supply, or poor quality or reliability of supply can create entry barriers for new businesses, and can hinder the productivity of existing businesses. When these barriers are removed, new businesses are developed and existing businesses can expand, thus also creating new jobs (in other words, jobs from second-order growth effects). The supply of electricity (or improved electricity) to upstream industries, which then stimulates their production, is called a forward production linkage. These linkages can affect any sector which uses electricity.[32]

35. Areas with limited energy supply will typically have less economic activity. Energy-intensive businesses will understandably avoid such areas, but such areas may also have lower levels of education and health, and worse living conditions because of the limitations on energy supply.[33] When a region gains access to good quality reliable energy, it can start to attract businesses to the area. Access to electricity may also have distributional effects within a region's population, for example, by allowing women to start home businesses.[34]

36. Second-order growth effects can also help to create jobs at existing businesses. The limitation of blackouts, interruptions, and surges allows existing businesses to be more productive, employ more people,[35] and operate during more hours.[36] Manufacturing facilities, or other businesses using energy-intensive machinery, may suffer losses due to power surges and voltage fluctuations, time lost on restarting machinery, or a damaged business reputation due to interruptions to time-sensitive processes. Improving quality and reliability of electricity reduces these costs and allows businesses to grow. [37] Existing businesses can also benefit from technology transfer in energy projects. IFI-financed energy interventions typically involve the use of international best practice and modern

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30 Bacon, Robert, and Masami Kojima. "Issues in estimating the employment generated by energy sector activities." World Bank, http://siteresources. worldbank. org/INTOGMC/Resources/Measuring_the_employment_impact_of_energy_sector. pdf (2011).

31 IFC, "Power sector economic multiplier tool: Estimating the Broad Impact of Power Sector Projects: Methodology," (2015).

32 IFC, "Power sector economic multiplier tool: Estimating the Broad Impact of Power Sector Projects: Methodology," (2015).

33 Brenneman, Adam, and Michel Kerf. "Infrastructure & Poverty Linkages." A Literature Review. The World Bank, Washington, DC (2002).

34 Saghir, Jamal. "Energy and poverty: myths, links, and policy issues." (2005).

35 These investments often generate many more indirect and induced jobs than direct jobs. However, the most significant effect of infrastructure projects on employment comes from improved services. For example, providing a reliable power supply allows businesses to produce more and hence create more jobs.

36 IFC, "IFC Jobs Study: Assessing Provate Sector Contributions to Job Creation and Poverty Reduction," (2013).

37 Brenneman, Adam, and Michel Kerf. "Infrastructure & Poverty Linkages." A Literature Review. The World Bank, Washington, DC (2002).

technologies, which may be new to the project area. Exposure to these practices and technologies gives local businesses new skill sets, productive processes, and knowledge of/access to more advanced technologies. Utilities also gain access to modern technologies (for example, advanced metering systems) through energy interventions, which improve their commercial performance.

37. Second-order growth effects can also impact the time individuals have available to work. Inadequate energy supply results in time poverty and health impacts which, when removed, give individuals more time to devote to employment. For women, time poverty is often the result of demanding household labor. Women have better access to jobs when they have access to electricity, and time-saving appliances which lessen the time needed for cooking, laundry, etc. Women may also be more likely than men to use this extra time to participate in market activities.[38] Illness is also a component of time poverty, particularly for women. Access to clean energy sources can reduce the incidence of respiratory illness, as it replaces the need for biomass fuel, which causes indoor air pollution.[39] These health benefits give workers additional time to work in which they are not sick, and in the case of children's health, provide mothers with additional time to work in which they do not need to care for sick children.

Induced jobs (job creation via additional spending)

38. Direct and indirect job creation provides workers with additional income to spend on goods and services in unrelated industries. This additional demand creates the need for new jobs in those industries.[40] The cycle continues as the workers in those sectors spend a portion of their incomes, thus further increasing demand in unrelated sectors, and the need for new jobs.[41]

39. Electricity consumers sometimes also benefit financially from energy efficiency measures. The money saved by households because of energy efficiency projects may be enough to more than offset the costs of the improvements.[42] With the additional disposable income saved on energy fees, consumers can spend their money elsewhere, again creating the need for new jobs in unrelated industries. For the poor, whose energy expenses comprise a large portion of household spending, energy efficiency measures can often result in lower charges and higher real incomes.[43] This is often true, even when the households are paying for the full cost of energy, since alternative, low quality energy sources utilized by the poor (for example, biomass) can be more expensive, take more time to gather, and are less efficient than good quality, reliable sources.[44][45] These higher real incomes provide an opportunity for the poor to shift their spending and help to create induced jobs.

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38 IFC, "IFC Jobs Study: Assessing Private Sector Contributions to Job Creation and Poverty Reduction," (2013).

39 Brenneman, Adam, and Michel Kerf. "Infrastructure & Poverty Linkages." A Literature Review. The World Bank, Washington, DC (2002).

40 "Energy for Economic Growth: Energy Vision Update 2012"- World Economic Forum and IHS CERA http://reports.weforum.org/energy-for-economic-growth-energy-vision-update-2012/#chapter-the-role-of-the-energy-sector-in-job-creation

41 Bacon, Robert, and Masami Kojima. "Issues in estimating the employment generated by energy sector activities." World Bank, http://siteresources. worldbank. org/INTOGMC/Resources/Measuring_the_employment_impact_of_energy_sector. pdf (2011).

42 Bacon, Robert, and Masami Kojima. "Issues in estimating the employment generated by energy sector activities." World Bank, http://siteresources. worldbank. org/INTOGMC/Resources/Measuring_the_employment_impact_of_energy_sector. pdf (2011).

43 ADB, "Infrastructure for Supporting Inclusive Growth and Poverty Reduction in Asia," (2012).

44 Brenneman, Adam, and Michel Kerf. "Infrastructure & Poverty Linkages." A Literature Review. The World Bank, Washington, DC (2002).

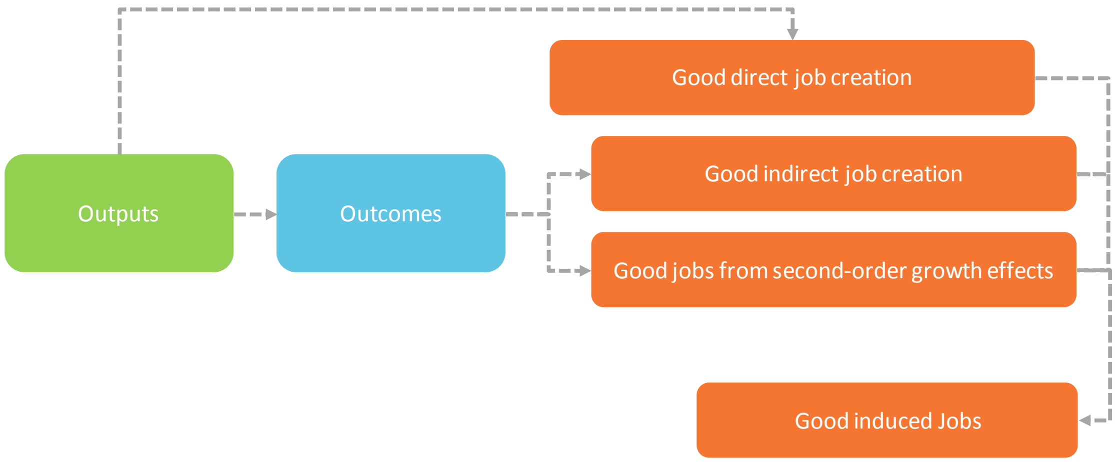
45 Saghir, Jamal. "Energy and poverty: myths, links, and policy issues." (2005).

3.3.2 Good job creation

40. While it is easy to argue, and relatively easy to observe that energy sector interventions create jobs, we are particularly interested in their ability to create good jobs. The creation of good jobs seems intuitively more distant in terms of causality, and only loosely tied to outputs and outcomes of energy interventions. Good jobs are created by the same causal links as jobs, but there are arguably more external influences, beyond the control of the intervention, that impact the success of good job creation. These factors may include social protections, labor laws, quality of education, and local technical knowledge and capacity. These factors can impact the quality of all jobs created, including direct, indirect, induced and second-order growth jobs.

41. Figure 3.3 shows the causal links for good job creation, which mirrors the causal links for job creation, shown in Figure 3.2, with the added requirements of situation-specific planning in order to mitigate risks, and positive external influences.

Figure 3.3: Causal Links for Good Job Creation



3.3.3 Growth and inclusive growth

42. The next impact we are interested in is inclusive growth. As is the case with good jobs, this impact is even more loosely linked with the outputs and outcomes of energy interventions. The chain of causality becomes longer and more tenuous as we move from growth to inclusive growth.

43. It is often argued that reliable supply of electricity can create economic growth.[46] There are three major causal links through which better energy supply is typically argued to promote growth. First, reliable energy allows businesses to increase their output and expand to broader markets, which has a positive impact on GDP.[47] Second, access to electricity reduces production and transaction costs. As a result, businesses can increase private investment.[48] Lastly, reliable energy increases productivity.[49] Contributions to economic growth can then occur both through the increase in labor productivity for existing

[46] Karekezi, S., S. McDade, B. Boardman and J. Kimani, "Chapter 2 - Energy, Poverty and Development," In Global Energy Assessment - Toward a Sustainable Future, Cambridge University Press, Cambridge, UK and New York, NY, USA and the International Institute for Applied Systems Analysis, Laxenburg, Austria, pp. 151-190. (2012).

[47] Brenneman, Adam, and Michel Kerf. "Infrastructure & Poverty Linkages." A Literature Review. The World Bank, Washington, DC (2002).

[48] Pueyo, Ana. "The Evidence of Benefits for Poor People of Increased Renewable Electricity Capacity: Literature Review." (2013).

[49] Karekezi, S., S. McDade, B. Boardman and J. Kimani, "Chapter 2 - Energy, Poverty and Development," In Global Energy Assessment - Toward a Sustainable Future, Cambridge University Press, Cambridge, UK and New York, NY, USA and the International Institute for Applied Systems Analysis, Laxenburg, Austria, pp. 151-190. (2012).

employment, and through employment that is shifted from low- to high-productivity sectors. Good jobs and growth are linked concepts, as both can result from increases in productivity (with growth being the broader impact of high levels of productive job creation).

44. As described in Section 1, **inclusive growth** combines growth with equality of opportunities. Inclusive growth impacts therefore require the causal links for growth (described above) in addition to causal links to distribute growth benefits equitably to disadvantaged populations. The link between growth and inclusive growth typically only exists if interventions specifically target the poor or other disadvantaged populations. For example, when poor communities are given access to modern energy, they can more easily attract new businesses, which create jobs and drive growth.[50] Job creation that specifically targets women, youth, residents of rural areas, or religious or ethnic minorities are also possible channels for inclusive growth.

45. It is also worth considering alternative definitions of “growth”. The paragraphs above have focused primarily on job creation and conventional ideas of economic growth, but energy interventions can also provide the poor with better quality of life. These impacts are important to recognize given that the purpose of economic activity is not solely to create growth, but also to sustainably promote human development, welfare, and wellbeing.[51] Access to good quality reliable energy provides many other benefits and improvements to the poor's daily lives. These benefits include more efficient lighting, which is available 24 hours a day, and can provide more time for education. Electricity also provides access to time-saving appliances that can alleviate time poverty for women and access to communication technologies and entertainment. Modern energy enables access to more efficient heating methods, and allows for refrigeration of food and medicine.[52] Access to modern energy can also minimize environmental harm on the poor by replacing fuel wood, which causes land degradation and harms the agricultural sector. It can also reduce indoor and outdoor air pollution, which can have serious health implications for poor households. Lastly, it can mitigate Greenhouse Gas (GHG) emissions & global warming, which have broader long-term repercussions.[53]

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[50] Brenneman, Adam, and Michel Kerf. "Infrastructure & Poverty Linkages." A Literature Review. The World Bank, Washington, DC (2002).

[51] Jacobs, Garry, and Ivo Slaus. "Indicators of economics progress: the power of measurement and human welfare." Cadum 1, no. 1 (2010): 53.

[52] International Energy Agency, "Modern energy for all: why it matters," http://www.worldenergyoutlook.org/resources/energydevelopment/modernenergyforallwhyitmatters/.

[53] Saghir, Jamal. "Energy and poverty: myths, links, and policy issues." (2005).

4 The Gap Between Theory and Evidence

47. Section 3 developed a theory of change which proposed a number of logical links between interventions in the energy sector of CWA countries, good jobs, and inclusive growth. This section describes the evidence supporting the theory of change.

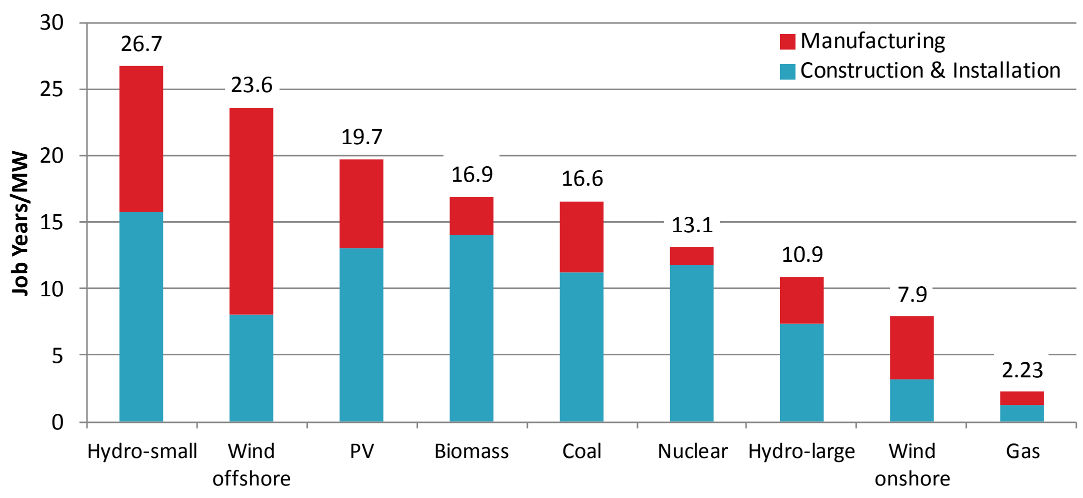
48. The evidence is still largely anecdotal. The links between energy sector interventions and outcomes (for example, adequacy, quality and cost of supply, access, and operational/commercial efficiency) are relatively easy to argue and test, but the links between energy sector interventions, job creation and economic growth are more tenuous. Links between energy sector interventions, good jobs and inclusive growth are more tenuous still. This section focuses on the latter, more tenuous links.

49. The evidence linking energy sector interventions to jobs is the most direct and easily observable. Linking energy interventions to good jobs is less direct, but still follows a reasonably direct logical path. Moving to the more distant impacts of growth and further, to inclusive growth, the evidence must be interpreted cautiously, as there are many external influences that also contribute to these impacts.

4.1 Links to Job Creation

50. The most easily observable evidence of job creation through energy interventions are the direct jobs created for CIM and O&M. Figure 4.1 shows construction and installation job years created per MW for various energy technologies. Figure 4.2 shows O&M jobs created per MW for those technologies. This data is based on OECD countries. However, in non-OECD Asia, up to 2.4 times the OECD job impacts are expected to be created per MW, due to differences in labor productivity (i.e. lower labor costs and more people employed to complete the same amount of work). This regional multiplier on job creation is estimated to decrease over time (2.3 for 2020 and 1.9 for 2030).[54]

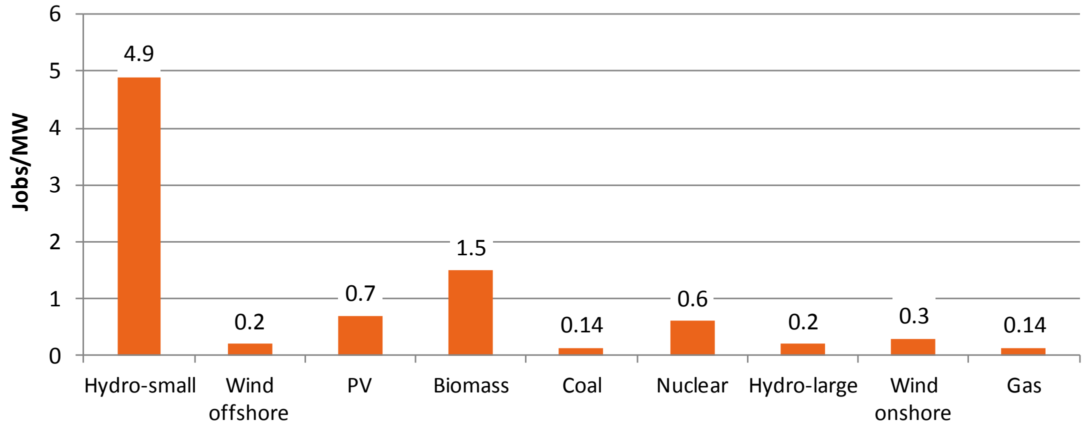
Figure 4.1: Job Years/MW Created for CIM by Technology



Source: Rutovitz, Jay, E. Dominish, and J. Downes. "Calculating global energy sector jobs: 2015 methodology." (2015).

[54] Rutovitz, Jay, E. Dominish, and J. Downes. "Calculating global energy sector jobs: 2015 methodology." (2015).

Figure 4.2: Jobs/MW Created for O&M by Technology



Source: Rutovitz, Jay, E. Dominish, and J. Downes. "Calculating global energy sector jobs: 2015 methodology." (2015).

51. There is also evidence that there can be job creation from second-order growth effects, including the development of small businesses and an increase in women's participation in the workforce. In Uzbekistan, for example, women participate in the economy through micro-enterprises and home businesses, which are energy-intensive and therefore require access to reliable energy.[55] A significant portion of the rural poor's energy consumption is for the productive activities of small medium enterprises (SMEs). Adequate electricity allows for the poor to have another means of income generation which can have an impact on rural poverty.[56] Electricity access, and the resulting alleviation of time poverty, also leads to women's participation in market activities. A study of the impacts of large-scale electrification of rural communities in South Africa revealed that female employment increased by 13.5 percent over five years due to electrification and the resulting effort and time saved in home production.[57]

52. Better reliability can also be shown to have second-order growth effects for existing businesses. When businesses have unreliable energy, they may use diesel backup generators to mitigate the impacts of outages. Generator use has been linked to 2.5 percent employment growth overall, and 4 percent employment growth in low and lower-middle income countries. We can assume that the employment growth resulting from a reliable grid-connected energy supply would be at least that resulting from access to a backup generator. Generators are typically significantly more expensive than grid connections, and provide a lower level of reliability, suggesting that a reliable grid connection may have even higher employment growth impacts.[58]

53. There is also evidence that energy sector projects create induced jobs. Energy sector jobs often require skilled workers and are highly productive in terms of contribution to GDP per worker. They are therefore highly paid, allowing energy workers to contribute more spending per capita than that of the average worker.[59] This additional spending helps

[55] Duban, Elisabeth, "REG: Promoting Gender-Inclusive Growth in Central and West Asia Developing Member Countries, Country Gender Assessment: Uzbekistan," ADB. (2012).

[56] Singh, Rozita, Xiao Wang, Juan Carlos Mendoza, and Emmanuel Kofi Ackom. "Electricity (in) accessibility to the urban poor in developing countries." Wiley Interdisciplinary Reviews: Energy and Environment 4, no. 4 (2015): 339-353.

[57] Dinkelman, Taryn. "The effects of rural electrification on employment: New evidence from South Africa." Population Studies Center, University of Michigan (2008).

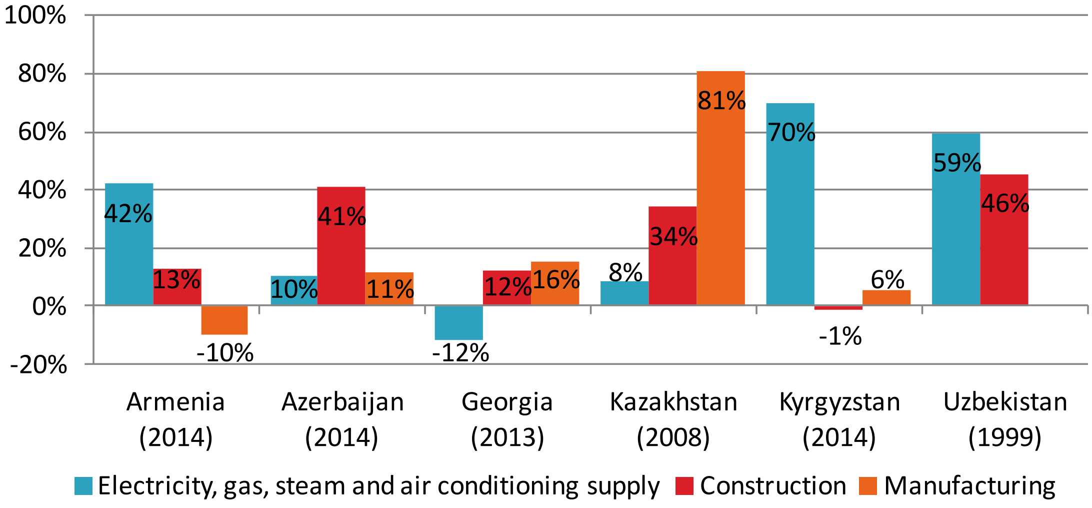
[58] IFC, "Chapter 6: Access to Infrastructure," http://www.ifc.org/wps/wcm/connect/83affa004f7ce00bb812fe0098cb14b9/chapter6.pdf?MOD=AJPERES.

[59] World Economic Forum, "Energy for Economic Growth, Energy Vision Update 2012," (2012).

to grow other sectors of the economy. Figure 4.3 shows the average monthly earnings of electricity, construction, and manufacturing jobs of CWA countries in relation to the overall labor force. Any bar showing a positive percentage represents a job type that has, on average, higher monthly earnings than those of the total labor force.

54. It has further been shown that the jobs created through energy interventions have some of the characteristics of good jobs.[60] The higher average monthly earnings of electricity, construction, and manufacturing jobs (i.e., the typical direct and indirect jobs from electricity projects), shown in Figure 4.3, support the theory that energy projects create good jobs. All countries except for Georgia show higher average monthly earnings for electricity, gas, steam and air conditioning supply jobs. All countries except for Kyrgyzstan show higher average monthly earnings for construction jobs, and all countries except for Armenia show higher average monthly earnings for manufacturing jobs. Some of these earnings differences are quite significant, as is the case for manufacturing jobs in Kazakhstan, which have 81% higher average monthly earnings than the total labor force.

Figure 4.3: Percent difference from average monthly earnings of total labor force



Source: ILO, "ILOSTAT Database: Mean nominal monthly earnings of employees by sex and economic activity," http://www.ilo.org/ilostat.

55. As evidence of good job creation through second-order growth impacts, rural electrification has been shown to increase the incomes of existing cottage industries in Asia.[61] The Energy Development Index, which includes several energy access indicators, is also strongly correlated with per capita income, suggesting a broader level of good job creation across various causal links (i.e. direct, indirect, induced, and second-order job creation).[62]

4.2 Links to Economic Growth

56. The evidence linking energy sector interventions to economic growth is surprisingly limited. The evidence most commonly cited is the strong correlation between energy consumption and national income.[63] Figure 4.4 shows changes in GDP and electricity use in CWA countries from 1990 to 2013. Here we can see that electricity use and GDP

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60 Note that this evidence is less direct, and mainly proves that the new jobs are well-paid, which is only one component of a good job.

61 Pachauri, Shonali, Narasimha Rao, Yu Nagai, and Keywan Riahi. "Access to modern energy: Assessment and outlook for developing and emerging regions." Laxenburg: IIASA (2012).

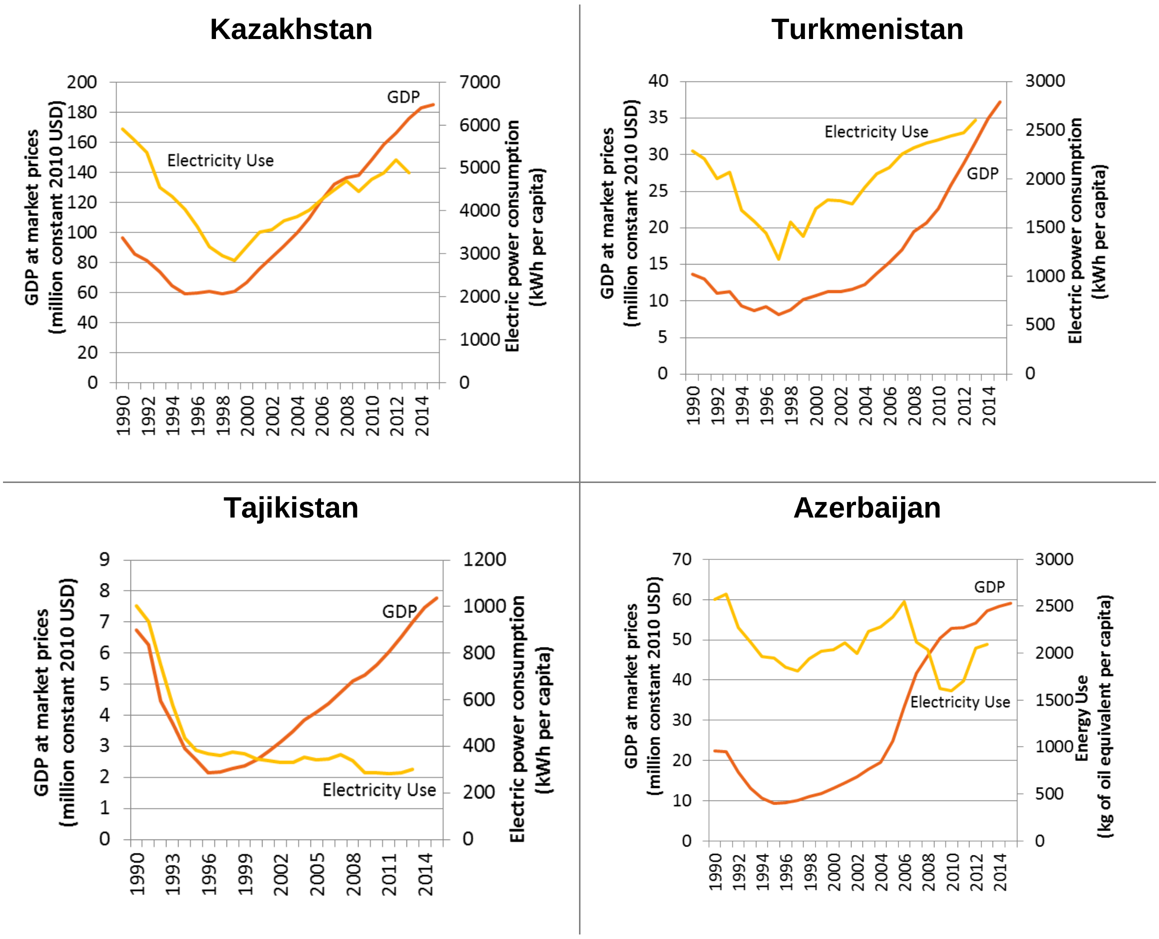
62 Pachauri, Shonali, Narasimha Rao, Yu Nagai, and Keywan Riahi. "Access to modern energy: Assessment and outlook for developing and emerging regions." Laxenburg: IIASA (2012).

63 Saghir, Jamal. "Energy and poverty: myths, links, and policy issues." (2005).

typically trend loosely together (with the exception of Uzbekistan, Tajikistan and Azerbaijan in some years), but the correlation is weak. While the time-series data for each country do not provide a convincing argument for the relationship between electricity use and GDP, comparisons across countries create a clearer picture. Figure 4.5 shows the GDP and electricity consumption of countries internationally. Here, there is appears to be a more consistent relationship between the two indicators.

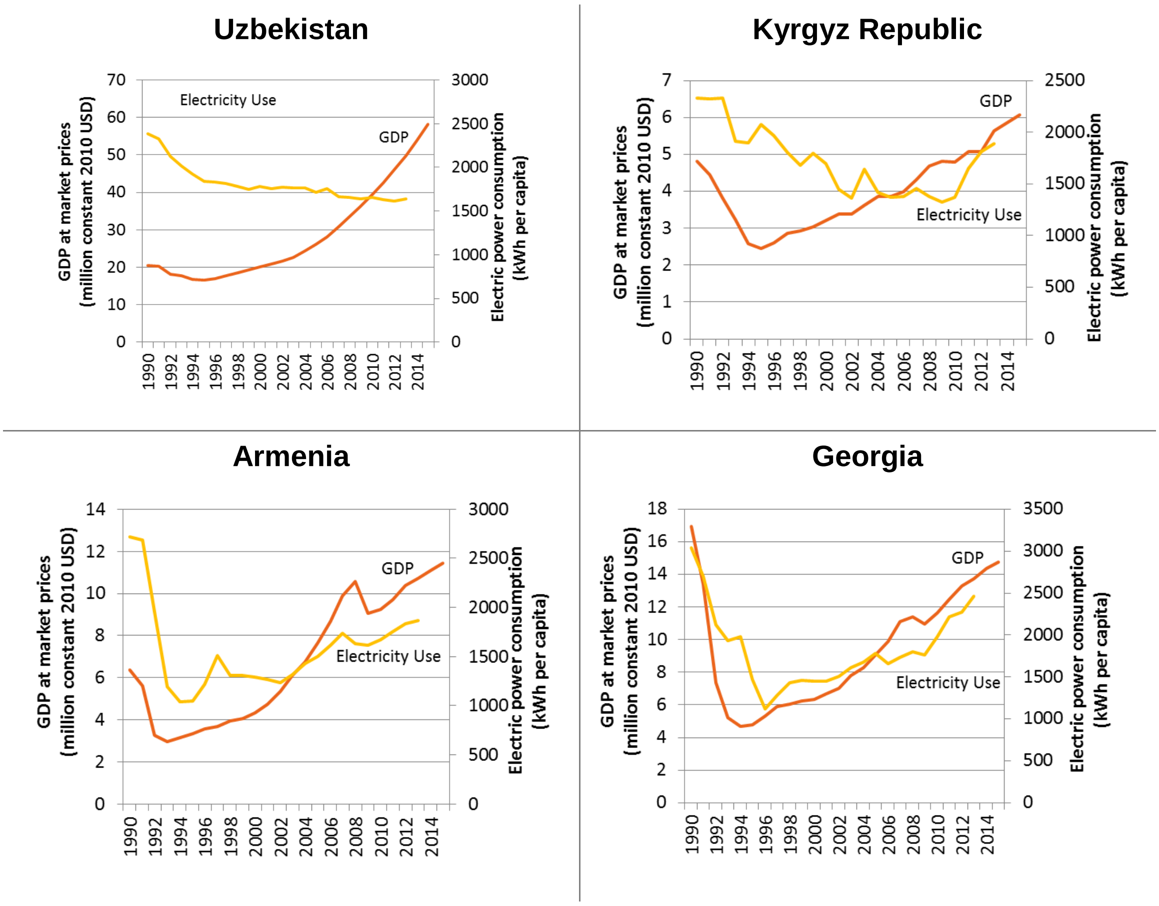
57. These trends must be interpreted cautiously, as quantitative studies show that the links (if any) between income growth and energy use can be bidirectional, with energy promoting income growth and income growth promoting increased energy use.[64] The bidirectional impacts are difficult to quantify, as there are many other interdependent factors affecting growth. Moreover, the links between energy use and GDP appear to vary between countries. A study of the relationship between per capita GDP and per capita energy consumption in Georgia, Azerbaijan, and Armenia found no relationship between the variables in Georgia and Azerbaijan and a unidirectional causality from GDP to energy consumption in Armenia.[65]

Figure 4.4: CWA GDP and Electricity Consumption (1990-2013)



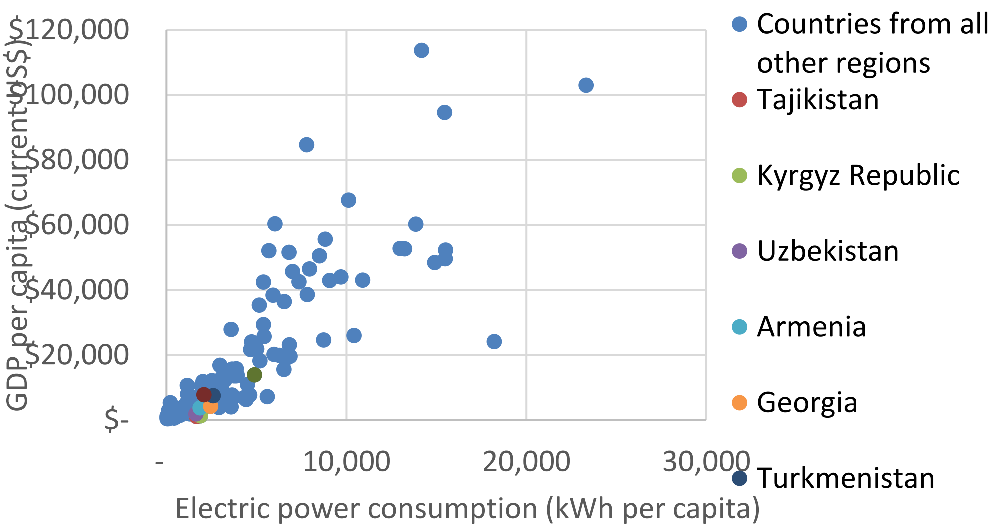
[64] Pachauri, Shonali, Narasimha Rao, Yu Nagai, and Keywan Riahi. "Access to modern energy: Assessment and outlook for developing and emerging regions." Laxenburg: IIASA (2012).

[65] Kalyoncu, Huseyin, Faruk Gürsoy, and Hasan Göcen. "Causality relationship between GDP and energy consumption in Georgia, Azerbaijan and Armenia." International Journal of Energy Economics and Policy 3, no. 1 (2013): 111.



Source: The World Bank, "World DataBank, World Development Indicators," Washington, D.C.: The World Bank. http://databank.worldbank.org/data/home.aspx.

Figure 4.5: International GDP and Electricity Consumption (2013)

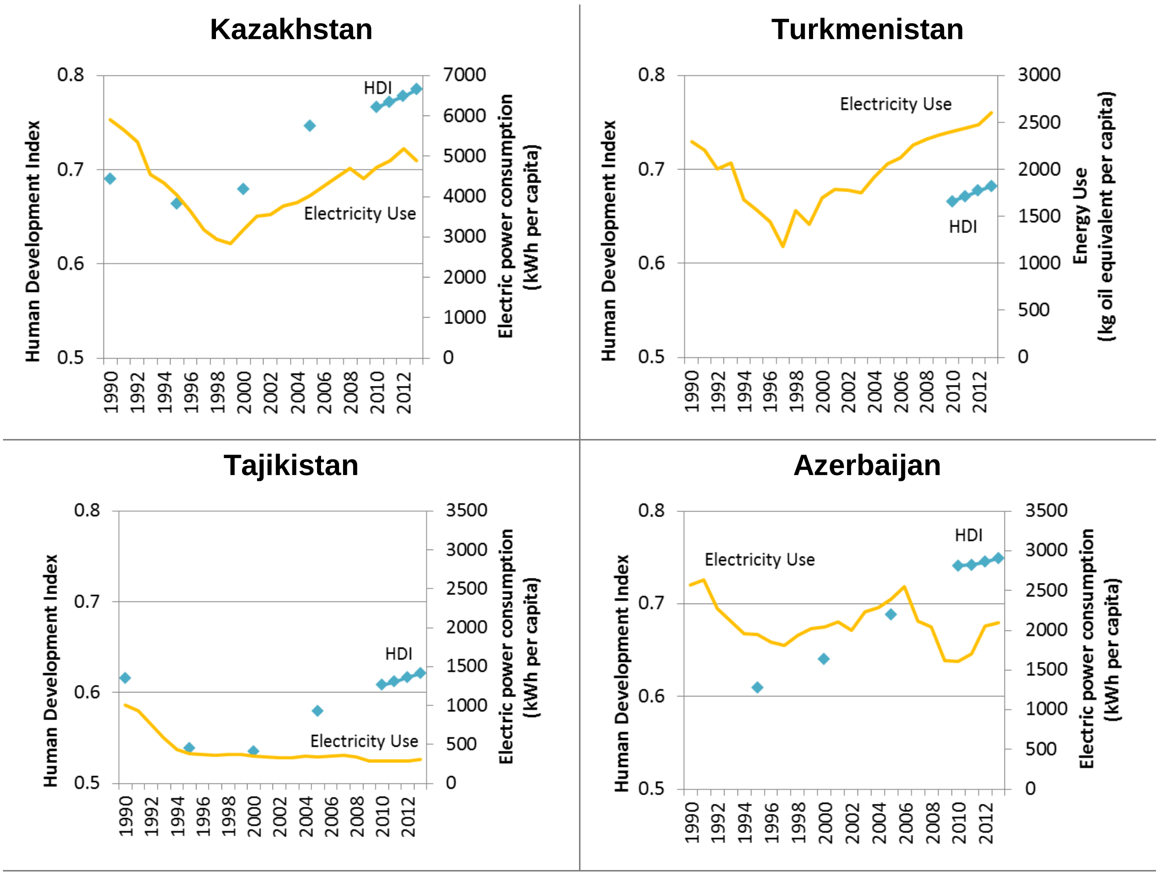


Note: The light blue dots represent 127 other countries, including all countries for which there was available data.

Sources: The World Bank, "World DataBank, World Development Indicators," Washington, D.C.: The World Bank. http://databank.worldbank.org/data/home.aspx.

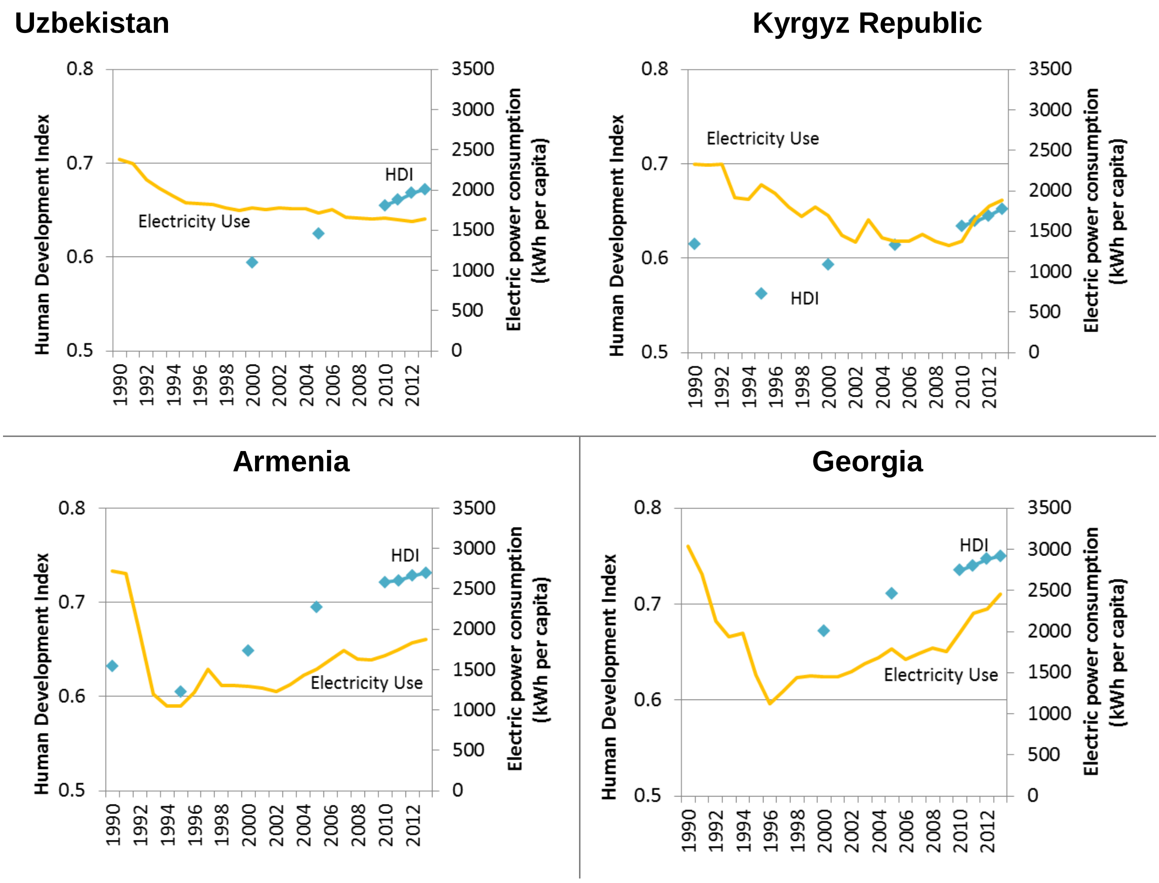
58. GDP is a common measure of growth, but it does not capture the quality of life benefits that can arise from access to improved energy. Alternative measures, such as the Human Development Index (HDI), the Index of Sustainable Economic Welfare, the Genuine Progress Indicator, and National Accounts of Well-being incorporate welfare attributes into measurements of growth.[66] The United Nations Development Programme's HDI incorporates a life expectancy index, education index, and Gross National Income index, to provide a summary measure of human development achievements.[67] This indicator is a valuable alternative for understanding the impact of energy on development. Figure 4.6 shows the HDI and electric power consumption in CWA countries for 1990 through 2013. The HDI trends loosely with electricity consumption in the CWA region, with the exception of Uzbekistan (as well as Tajikistan and Azerbaijan in some years). The relationship between energy use and the HDI (as with GDP), is more apparent when looking at cross-country comparisons (see Figure 4.6).

Figure 4.6: CWA HDI and Electricity Consumption (1990-2013)



66 Jacobs, Garry, and Ivo Slaus. "Indicators of economics progress: the power of measurement and human welfare." Cadum 1, no. 1 (2010): 53.

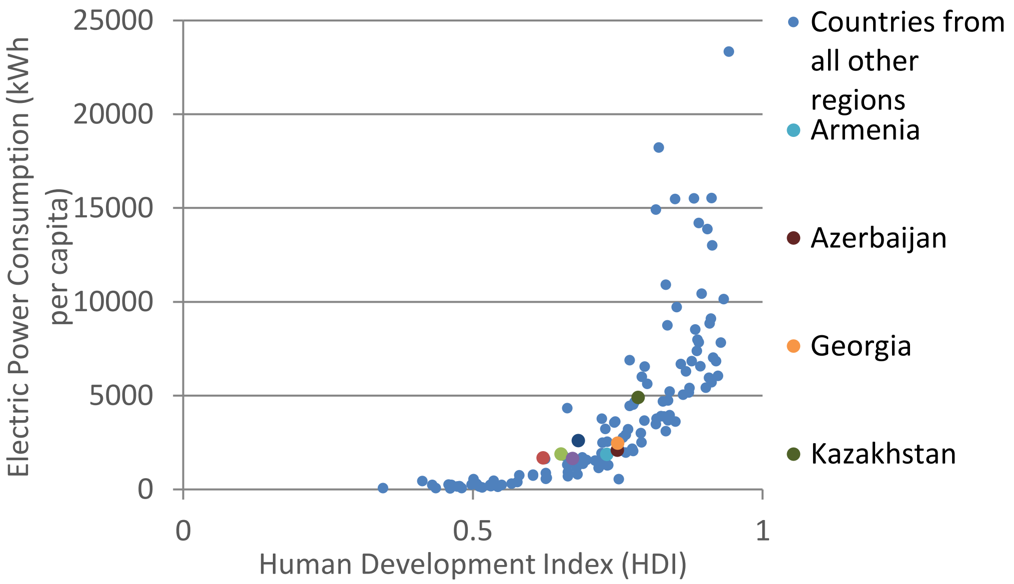
67 UNDP, "Human Development Index (HDI)," Accessed August 25, 2016. http://hdr.undp.org/en/content/human-development-index-hdi.



Sources: The World Bank, "World DataBank, World Development Indicators," Washington, D.C.: The World Bank. http://databank.worldbank.org/data/home.aspx.

UNDP, "Human Development Data," Accessed 25 August 2016. http://hdr.undp.org/en/data.

Figure 4.7: International Energy Consumption and HDI (2013)



Sources: The World Bank, "World DataBank, World Development Indicators," Washington, D.C.: The World Bank. http://databank.worldbank.org/data/home.aspx.

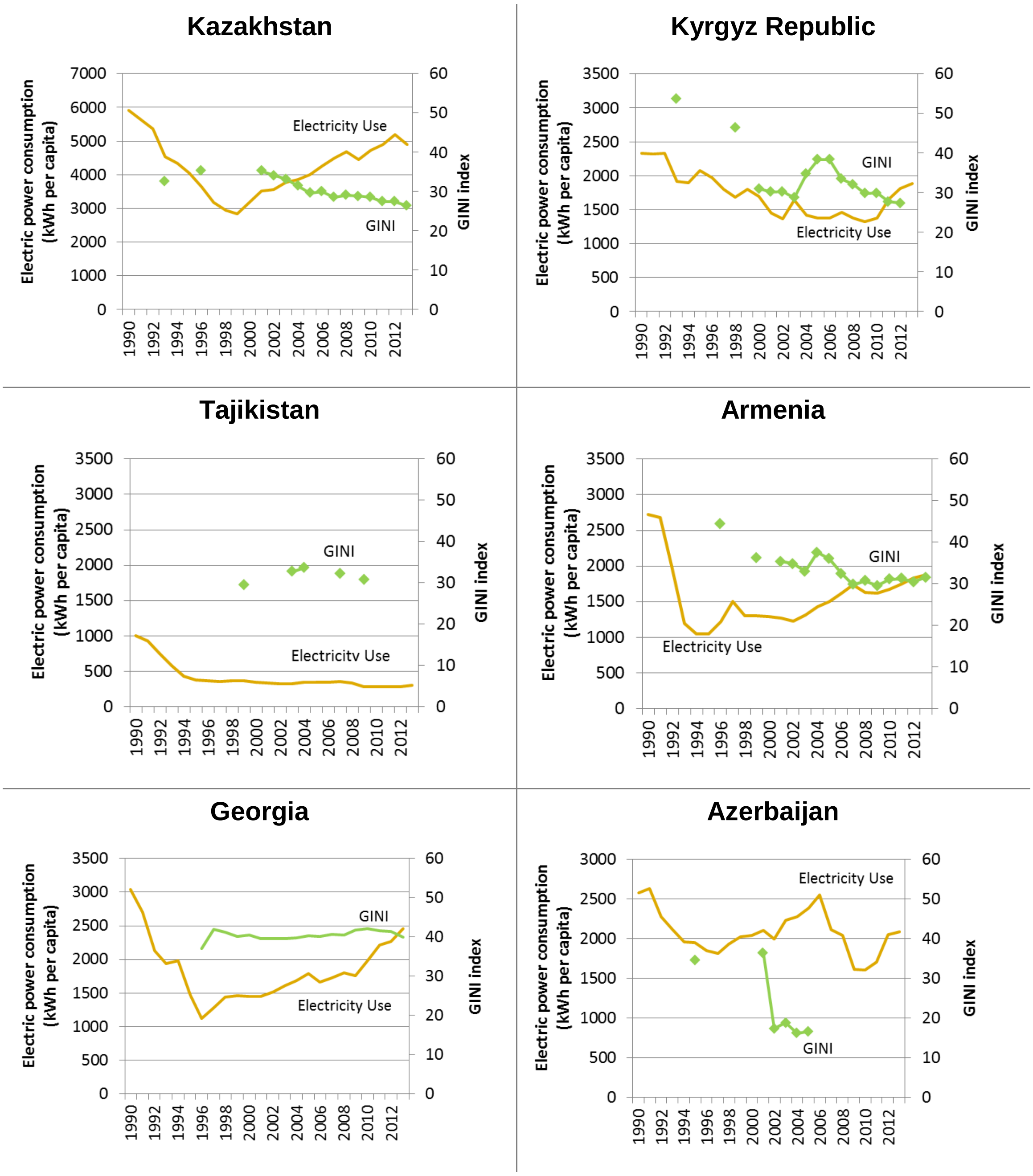
UNDP, "Human Development Data," Accessed 25 August 2016. http://hdr.undp.org/en/data.

59. There is also some evidence to suggest that energy sector interventions promote inclusive growth. This evidence relies primarily on observed changes in income equality, which serves as an indicator of the equitable allocation of job opportunities. There are no studies on energy projects and income equality in the CWA region, but experience elsewhere in the world does offer some evidence of a relationship between energy access and income equality. For example, a review of the World Bank's Latin America experience (2003) revealed that, in Guatemala, improved access to electricity, water and telephones led poorer groups to gain more equal incomes.[68]

60. Regionally, we can look at Gini coefficients (a measure of income inequality) as compared to energy use, and examine correlations. The Gini index ranges from 0 to 100. An index of zero represents perfect equality and an index of 100 represents perfect inequality. A Gini index that decreases (increases) over time therefore shows incomes becoming more (less) equal. We would expect to see that as electricity use increases, the Gini coefficient decreases, indicating increased income equality. This relationship sometimes holds, as in Kazakhstan and Armenia (depicted in Figure 4.8), but other countries show trends that are more complex and difficult to interpret. It may be overly simplistic to expect energy use to align with the Gini index, as income inequality is a complex worldwide problem. The United States, for example, has a Gini coefficient of 41 despite being a wealthy developed country, with abundant energy infrastructure.[69] Because income inequality has so many contributing factors, it is difficult to causally link changes directly to energy infrastructure.

[68] ADB, "Infrastructure for Supporting Inclusive Growth and Poverty Reduction in Asia," (2012).
[69] The World Bank, "World DataBank, World Development Indicators," Washington, D.C.: The World Bank. http://databank.worldbank.org/data/home.aspx.

Figure 4.8: CWA Energy Use and Gini Indexes (1990-2013)



Source: The World Bank, "World DataBank, World Development Indicators," Washington, D.C.: The World Bank. http://databank.worldbank.org/data/home.aspx.

5 Explaining the Gap

61. Energy sector interventions may not always create good jobs or foster inclusive growth, even if the target outputs and outcomes have all been achieved. The theory of change developed in Section 3, and the evidence presented in Section 4 suggest that there may indeed be causal links between energy sector interventions, job creation and economic growth. The logic and evidence start to weaken on the way to the ultimate goals of "good" jobs and "inclusive" growth. This section analyzes how and why the evidence fails to support the last step in the theory of change or "performance story" developed in Section 3.

62. The performance story sometimes breaks down because of confounding or intervening factors along the chain of causality. The result is unintended consequences, despite good intentions: The jobs created are not good, or the growth is not inclusive. In many other cases, however, the intervention cannot reasonably be expected to follow the performance story at all, given the outputs planned for the project. This is a case of unreasonable expectations.

5.1 Jobs Created Are not "Good"

63. Most definitions describe good jobs as stable, safe, and well-paid.[70] However, the jobs created through energy interventions may not always fit these criteria. The ILO has described the "decent work deficits" that exist within the sector.[71] These deficits include the prevalence of non-standard forms of employment, lack of adequate social protection (which is associated with high levels of poverty), and the prevalence of fatal and non-fatal accidents and diseases.[72] Jobs created through technical energy sector interventions may also not be stable, as they are limited by the duration of the project or life of the infrastructure. Direct CIM jobs created through energy infrastructure, and indirect jobs which contribute to the provision of construction materials and services, are temporary and only last for the life of the project, unless there is another project or further need for the materials and services.[73] The average time to construct new electricity generating infrastructure varies by technology, but typically ranges from two to six years.[74][75] The added spending from the CIM workers, which creates induced jobs, is also temporary. Likewise, the additional spending from O&M jobs last for the life of the plant, as do the induced jobs from the extra spending of O&M workers.[76] Plant lifetimes typically range from 20 to 60 years, depending on the technology.[77] However, it is also possible that there

70 See A.1 for a list of good job definitions.

71 ADB and other IFIs do work to mitigate these risks. Projects funded by ADB, for example, typically require better worker conditions than the national standard. Construction workers have mandatory safety equipment (helmets, safety boots, safety gloves), and trainings on health, safety, environment, and technical construction, in accordance with international best practices. ADB's Social Protection Strategy includes compliance with the project country's labor legislation, including minimum wage, safe working conditions, social security contributions, etc. ADB also upholds the International Labor Organization's Core Labor Standards, which include freedom of association and the right to collective bargaining, abolition of forced or compulsory labor, elimination of discrimination in respect of employment and occupation, and elimination of child labor.

72 International Labour Organization, "Global Dialogue Forum on Good Practices and Challenges in Promoting Decent Work in Construction and Infrastructure Projects," (2015).

73 Bacon, Robert, and Masami Kojima. "Issues in estimating the employment generated by energy sector activities." World Bank, http://siteresources. worldbank. org/INTOGMC/Resources/Measuring_the_employment_impact_of_energy_sector. pdf (2011).

74 This is a US-based estimate, and the actual range in the region may be longer, and may vary by country.

75 U.S. Energy Information Administration, "Cost and Performance Characteristics of New Generating Technologies, Annual Energy Outlook 2016," (2016).

76 Bacon, Robert, and Masami Kojima. "Issues in estimating the employment generated by energy sector activities." World Bank, http://siteresources.worldbank.org/INTOGMC/Resources/Measuring_the_employment_impact_of_energy_sector. pdf (2011).

77 Tidball, Rick, Joel Bluestein, Nick Rodriguez, and Stu Knoke. "Cost and performance assumptions for modeling electricity generation technologies." Contract 303 (2010): 275-3000.

may not be adequate funding for O&M staff after project completion. ADB's 2015 Development Effectiveness Review, which tracks 17 indicators of development progress and effectiveness, found that one-third of ADB operations which have outputs, outcomes, or benefits that may not last. This is due to a lack of institutional arrangements, funding, and/or capacity for O&M after the conclusion of ADB's project support. [78]

64. The duration of a project's life (and therefore of job creation) can also fail to meet expectations for institutional reasons. Rural electrification projects sometimes fail because, once the assets are installed, there is no entity with a clear responsibility and incentive for continued maintenance and operation. Responsibilities for operations and maintenance are sometimes given to communities which may not have institutions or individuals who are both capable of, and sufficiently incentivized to do what is needed to keep the assets running. The development of community-based micro-hydropower in remote rural areas of Tajikistan (completed in 2007) was a pilot project, with the intent to demonstrate a viable option for meeting the wide energy supply gap in winter, and improving quality of life during winter months. However, the project was considered only partly successful. The technical assistance completion report notes that the community-based Energy User Association (which owns the micro-hydro plant) needs support, as it is limited in resolving major incidents or handing maintenance or remedial works which are costly and require expertise.[79] This example is not unique to Tajikistan or ADB-financed projects. There is evidence of similar consequences for rural electrification projects in the Pacific region and in Africa.

5.2 Growth Is not "Inclusive"

65. Growth and job creation from energy interventions may not always be inclusive. It has been shown that new jobs from infrastructure disproportionately benefit men due to differences in education, labor, and social roles. In Kazakhstan and Uzbekistan, it has been found that women have a difficult time accessing the jobs which ADB helps to create, because of educational and occupational segregation, as well as a lack of implementation of gender equality policies in the energy sector.[80][81] Differences in social roles can also impact women's access to new jobs. Women are not always able to obtain the benefits of time-saving appliances, which free up their time to contribute to the workforce. In Uzbekistan, for example, energy investments have not historically focused on household-level efficiency, and men are generally responsible for household finances and making decisions about purchasing appliances.[82]

66. Jobs may also not be inclusive to the rural poor or to domestic workers in general, because of low education and skill levels. In the Kyrgyz Republic, access to, and quality of post-secondary education is typically worse in rural and remote areas. The inequality of education has been identified as an important constraint to inclusivity and the ability for people to move out of poverty.[83] Figure 5.1 shows the education levels of the labor force for five CWA countries. Nearly 100 percent of the labor force in these countries has some level of education (primary or above), but there is considerable variation between countries in the level of education achieved.

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78 ADB, "2015 Development Effectiveness Review," (2016).

79 ADB, "Technical Assistance Completion Report; TA 4423-TAJ: Development of Community Based Micro-Hydropower Supply in Remote Rural Areas," (2010).

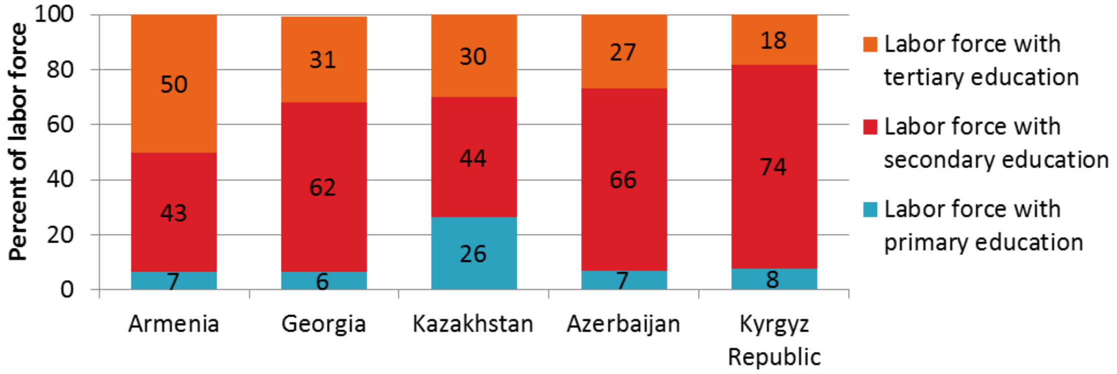
80 Duban, Elisabeth. "Regional: Promoting Gender-Inclusive Growth in Central and West Asia Developing Member Countries, Country Gender Assessment: Kazakhstan," *ADB*. (2012).

81 Duban, Elisabeth, "REG: Promoting Gender-Inclusive Growth in Central and West Asia Developing Member Countries, Country Gender Assessment: Uzbekistan," *ADB*. (2012).

82 Duban, Elisabeth, "REG: Promoting Gender-Inclusive Growth in Central and West Asia Developing Member Countries, Country Gender Assessment: Uzbekistan," *ADB*. (2012).

83 ADB, "The Kyrgyz Republic Strategic Assessment of the Economy: Promoting Inclusive Growth," (2014).

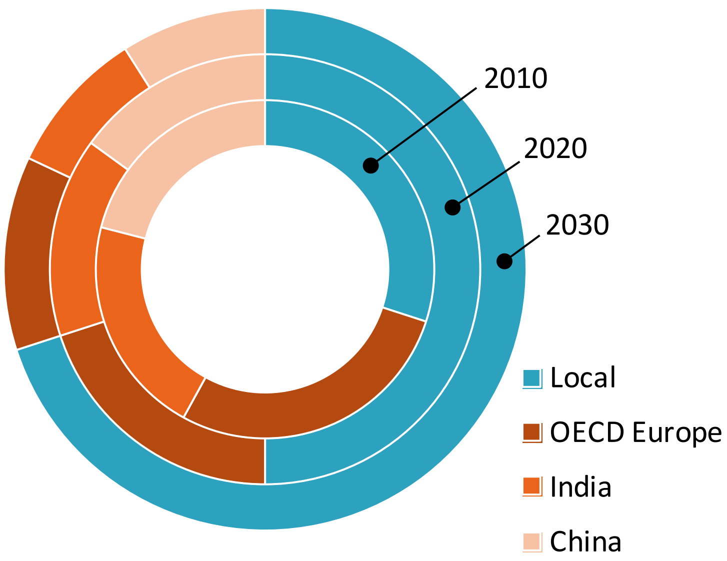
Figure 5.1: Education Level of the Labor Force



Source: World Bank DataBank, "World Development Indicators," Accessed June 24, 2014. http://databank.worldbank.org.

67. Domestic workers may also be excluded, especially from manufacturing jobs. The inclusivity of direct job creation is affected by the level of domestic manufacturing.[84] In 2010, only 30 percent of manufacturing for RE technologies in Non-OECD Asian countries was estimated to have been undertaken in the region.[85] This percent is expected to increase to 50 percent by 2020 and 70 percent by 2030. Of the equipment imported for RE technologies, an estimated 40 percent is from OECD Europe, 30 percent from India, and 30 percent from China.[86] Figure 5.2 depicts the estimated percentage of RE technologies manufactured locally or imported.

Figure 5.2: Local Manufacturing and Import of RE Technologies in Non-OECD Asia



Source: Rutovitz, Jay, E. Dominish, and J. Downes. "Calculating global energy sector jobs: 2015 methodology." (2015).

[84] Bacon, Robert, and Masami Kojima. "Issues in estimating the employment generated by energy sector activities." World Bank, http://siteresources. worldbank. org/INTOGMC/Resources/Measuring_the_employment_impact_of_energy_sector. pdf (2011).

[85] RE technologies here include including wind, solar PV, solar thermal power, geothermal power, and ocean (wave and tidal) technologies

[86] Rutovitz, Jay, E. Dominish, and J. Downes. "Calculating global energy sector jobs: 2015 methodology." (2015).

68. Some energy sector interventions may work *against* inclusivity, making things worse for the poor. Renewable energy technologies are, for example, associated with a potential mismatch of job skills between old and new infrastructure, and lower employment intensity. In the case of switching from fuel-based to renewable technologies, there may be difficulty in attaining the right skills and capacity. Much of the labor required for fuel-based generation is unskilled, and the education level required for the production/collection of fuels is typically vocational (particularly if there is less mechanization). RE technologies, however, require new types of skilled labor which are often missing or scarce. Therefore, even with the creation of new jobs, RE projects could have negative net employment effects if they are not accompanied by appropriate retraining policies.[87]

69. Tariffs in the region are generally below cost-recovery levels, except in Armenia and Georgia (countries where the private sector dominates ownership of energy infrastructure). Affordability is therefore not yet a serious problem in most of the countries, but if tariff reforms proceed, as they will need to in order for many of the energy service providers to survive, affordability could indeed become a concern. The introduction of more expensive sources of generation could also create affordability concerns.[88] For the rural poor, who often have agricultural jobs and experience seasonal income, it may be difficult to make regular electricity payments. Connection costs, which can range from USD 20 to 1,000 in developing countries, can also be prohibitive to rural customers, who do not have the money or access to credit to pay this fee up-front.[89] Businesses may also face problems with affordability if tariffs increase. Despite the jobs created by an energy investment, if the energy prices are raised too high the overall impact of the project could be negative. Thus, there is a balance that must be reached between affordability and cost-recovery.[90]

5.3 Unreasonable Expectations

70. Good jobs and inclusive growth are often included as intended impacts of an intervention at the project planning stages, but these impacts are sometimes treated as abstract additions for which the intervention cannot truly be held accountable. Project outcomes in the DMF are typically very specific, and are reinforced with measurable indicators, but impacts are typically broad and listed without any indicators. Consequently, projects may not be designed with specific mechanisms for achieving these impacts, resulting in missed opportunities, including those presented in Section 3.3.2.

71. ADB’s Strategy 2020, which describes ADB’s strategic direction to the year 2020, focusses on the following strategic agendas: Inclusive economic growth, environmentally sustainable growth, and regional integration. Infrastructure projects (like all ADB projects) must address at least one of the strategic agendas. In practice, projects which do not align directly with one of the agendas are often lumped in with inclusive growth, which is arguably the broader of the strategic agendas). Strategy 2020 envisions infrastructure’s role in inclusive growth as a vehicle to create “high sustainable economic progress, connect the poor to markets, and increase their access to basic productive assets”. A project which connects rural villages to electricity, for example, would clearly fit well into this category. However, other types of energy projects, such as the purchase of SCADA (supervisory control and data acquisition) software, can be very difficult to link to these inclusive growth impacts. Interviewees have suggested that it may be detrimental to

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[87] Lucas, Hugo, and R. Ferroukhi. "Renewable Energy Jobs: Status, Prospects & Policies, Biofuels and grid-connected electricity generation," *IRENA* (2011).

[88] Tariffs in the region are generally below cost recovery levels, except in Armenia and Georgia (countries where the private sector dominates ownership of energy infrastructure). See Appendix B for more details.

[89] Saghir, Jamal. "Energy and poverty: myths, links, and policy issues." (2005).

[90] World Economic Forum, "Energy for Economic Growth, Energy Vision Update 2012," (2012).

confine projects to three strategic agendas, which cover much but not all of the diverse work that ADB does in the energy sector. For those projects grouped in with inclusive growth by process of illumination, the process of writing DMFs can become a creative exercise which shifts the focus away from proper design and toward the creation of a convincing story.

72. It may not be reasonable to expect good jobs and inclusive growth impacts without the additional inclusion of specific mechanisms for that purpose in the project design (for example, skills training, quotas for jobs to be filled by disadvantaged populations, etc.). In addition, even with the inclusion of appropriate mechanisms, it may not be realistic to expect any individual project to make a noticeable impact on inclusive growth, as it is a large-scale impact requiring consistent progress through many interventions over many years. Rather, it may be more reasonable to present inclusive growth as a long-term impact for which the individual intervention is expected to make a small (possibly immeasurable) contribution, while a larger sequencing of interventions is held accountable, as a whole, for achieving measurable progress.

6 Improving Project Design and Implementation

73. The problems described in Section 5, can be mitigated, in part, through thoughtful and relevant project design, and implementation. The following recommendations include existing good practices which have been utilized in some ADB projects, best practices from related literature, and our own interpretation of the observed problems.

Improving job stability

74. As suggested in ADB's 2015 Development Effectiveness Review, one way to ensure job stability is through the implementation of cost-recovery energy tariffs, which allow for adequate budgets for O&M staff after the project has been completed.[91] For workers who will not be needed after the duration of a short project, good job impacts can still be lasting if skills can be transferred to other jobs/projects. Another quality of good jobs is adequate social protections. As discussed in Section 5.1, ADB and other IFIs do operate under internationally accepted standards for workers, and also help to uphold country level standards. Another strategy which ADB implements is to seek out contractors, subcontractors, and goods/services providers for projects that have the management system capacity to meet ADB's social protection requirements.[92]

Promoting inclusion

75. The second confounding factor to address is job creation that is not inclusive, particularly for women, the poor, and locals. In order to promote inclusivity for women, some ADB projects utilize targets for the percentage of jobs which should be allocated to women, or include a social and gender expert to ensure the proper implementation of gender activities. In countries where women have less access to infrastructure jobs due to social rules or safety issues, simultaneous projects focused directly on gender inclusion would be complementary.

76. Inclusion is also an issue for the poor or for locals in general, who may lack the necessary skills or education to fill new jobs. Active labor market interventions that allow workers to gain these skills generally make job creation more successful.[93] ADB's Social Protection Strategy includes skills development programs, among other active labor market programs.[94] In the case of renewable energy projects, a skills mapping should also be done to identify matching skills and skills gaps. This mapping can serve as the basis for training and education programs where skills are lacking, and as a guide for providing jobs in areas where skills are strong. It is also beneficial to provide services which match workers to appropriate jobs, and to focus job creation on areas where there is currently low employment.[95] For projects in which international expertise is necessary, local firms can still be involved as subcontractors. This level of involvement allows those firms to participate in the global value chain. They also receive the benefits of learning about international business practices, skills and technologies, which they can use to improve and grow their businesses.

77. There are also likely to be differences in the level of inclusivity for local labor between generation, transmission, and distribution interventions. It is important to recognize these. Generation projects typically require external design and manufacturing. Installation may allow for local engineers and companies to participate as a part of a joint venture or as subcontractors. For transmission projects, equipment (for example,

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91 ADB, "2015 Development Effectiveness Review," (2016).
92 ADB, "Development Effectiveness Report 2012: Private Sector Operations," http://www.adb.org/sites/default/files/institutional-document/33931/files/defr-2012-psod.pdf. (2013).
93 Lucas, Hugo, and R. Ferroukhi. "Renewable Energy Jobs: Status, Prospects & Policies, Biofuels and grid-connected electricity generation," *IRENA* (2011).
94 ADB, "Our Framework Policies and Strategies: Social Protection," (2003). http://www.adb.org/sites/default/files/institutional-document/32100/social-protection.pdf.
95 Lucas, Hugo, and R. Ferroukhi. "Renewable Energy Jobs: Status, Prospects & Policies, Biofuels and grid-connected electricity generation," *IRENA* (2011).

switchgears and transformers) and materials (for example, conductors) may be imported if the project is large or highly specialized, or produced locally for smaller projects, depending on the country's manufacturing capacity. Installation for these projects can often be completed by local contractors and utilities. Distribution projects are typically more low-tech than generation and transmission projects, and can often be completed by local workers. These projects are labor intensive, allowing for local job creation. The choice of technology also determines the level of local involvement for distribution projects. Low-tech meters for example, can be manufactured locally, but smart metering technology may need to be imported.

78. It is also important to recognize how job impacts are influenced by geographic location. Rural areas may be provided less access or lower quality energy, due to the additional costs faced by utilities to serve them. Privatized or reformed electricity companies tend to focus on provision of energy to non-poor urban areas, because of the additional costs associated with serving rural areas, and the lack of assurance that the rural poor could pay the required cost-recovery tariffs.[96] Even if equal access and quality is attained in rural areas, the higher costs faced by utilities mean that rural communities sometimes have to pay higher connection fees and tariffs than urban areas.[97] These higher prices may lessen the extent to which businesses can utilize electricity (thus lessening second-order growth impacts), and may also lessen induced job impacts. In addition to the unequal provision of energy and unequal energy tariffs, rural businesses may also be less successful than those in urban regions where there are adequate roads and telecommunications, access to other communities, and access to more resources that they can utilize.[98] It may be harder, therefore to promote inclusive growth in rural areas.

79. Projects can also be planned to strategically avoid locations that are unlikely to show much success, in favor of locations with favorable conditions for the success of a project. This approach is valuable in the sense that a bigger impact is achieved (i.e. more job creation, and a greater contribution to growth). However, it could also be criticized as cherry-picking, and risks excluding the most vulnerable populations. The second choice is to couple the energy project with complementing projects to address poor existing conditions. For example, an energy projects in a remote rural area may not help to create many new businesses, due to the inaccessibility of external markets. To improve the existing conditions, this project could be coupled with a transportation or telecommunication project. This approach is valuable because it allows the most in-need populations to be reached (i.e. inclusivity). However, this approach could be criticized as having smaller growth contributions at greater monetary costs. There is some tension between job creation/growth and inclusivity in these alternatives, but either is arguably better than conducting a one-size-fits-all intervention, which does not address the initial conditions and therefore has little impact (inclusive or otherwise).

80. Project design can also improve inclusivity by incorporating concerns about affordability. As tariff reform occurs it is important to keep in mind affordability for the poorest customers. Tariff setting can take affordability into account through subsidies which are appropriately targeted to the poor and at a level which allows for affordable consumption of a basic needs level of energy, without promoting overconsumption. It is important that subsidies are appropriately targeted so that the benefit is captured by the poor. A lifeline tariff applied to the entire population for example, may provide more savings for the rich than for the poor. Direct cash benefits or energy coupons, targeted in the same

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[96] Karekezi, S., S. McDade, B. Boardman and J. Kimani, "Chapter 2 - Energy, Poverty and Development," In Global Energy Assessment - Toward a Sustainable Future, Cambridge University Press, Cambridge, UK and New York, NY, USA and the International Institute for Applied Systems Analysis, Laxenburg, Austria, pp. 151-190. (2012).

[97] Saghir, Jamal. "Energy and poverty: myths, links, and policy issues." (2005).

[98] Pueyo, Ana. "The Evidence of Benefits for Poor People of Increased Renewable Electricity Capacity: Literature Review." (2013).

way as food or education benefits, may be a good alternative. Armenia's Poverty Family Benefit Program (PFBP), for example, provides small monthly stipends to poor households. The PFBP has been used by the government in conjunction with other measures to help alleviate energy poverty; In 2011, a lifeline tariff for natural gas consumption was introduced for PFBP beneficiaries.[99] This type of subsidy allows the poor to afford the energy they need, without encouraging overuse by the non-poor. Through this method, the poor are even encouraged to conserve energy, so that they may use their surplus benefits on other household needs.[100] Connection fees which are paid in installments or incorporated into the tariff can also make connections more affordable for those without the ability to pay a large sum up-front. In addition, payment schedules should reflect the variability and seasonality of the population's income sources, particularly for rural agricultural workers. In order to address the other unintended impact of a misalignment of skills between old and new infrastructure, we recommend again skills training and skills mapping, as described in the paragraph above.

81. A final, and critically important change would be to formally acknowledge that not all energy sector interventions can be expected to lead to good jobs or inclusive growth. Some energy sector interventions can indeed be expected to logically lead to job creation and growth, but not to good job creation or inclusive growth. Adherence to the strategic agendas makes sense when possible, but it may also be important to allow for projects that do not fit nicely into Strategy 2020 categories to be categorized otherwise. ADB could consider a "complementary strategies" category which would encompass all projects that fit ADB's broader mission, but do so in a way which is complementary (but not directly related) to at least one of the strategic agendas. This would allow DMFs to be more easily reflect, and measure progress against, a project's true objectives. Measuring progress against objectives requires clear, measurable indicators. Recommendations for such indicators are included in Section 7.

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99 World Bank, "Scaling Up Renewable Energy Program Investment Plan for Armenia," April 2014.

100 Lee, Minsoo, Donghyun Park, and Harry Saunders. "Asia's Energy Adequacy, Environmental Sustainability, and Affordability: An Overview." *Asian Development Bank Economics Working Paper Series* 398 (2014).

7 Setting the Right Indicators and Targets

82. A persuasive case can be made for linking good jobs and inclusive growth to energy sector interventions, but the evidence thus far is scarce. If good job creation and inclusive growth are to continue to be priorities of future projects, it will be important to be able to measure the outcomes as a part of evaluating the intervention or sequence of interventions.

83. The recommendations in this section focus on creating measurable outcome indicators, targets and baselines that can be used in ADB's DMFs. We also suggest potential indicators for impacts, though DMFs typically only require specification of indicators and targets at the output and outcome levels. Impact indicators may, however, be useful to ADB thinking about energy sector interventions at a higher, strategic level. Some of the terminology used in this section is specific to ADB's project evaluation framework, but the recommended indicators could be used in designing and evaluating any intervention in the energy sector, regardless of the funder or implementing agency.

84. Some of the indicators we recommend require better data quality and availability than is typically available in many ADB countries. We therefore include alternative indicators, focused on assessing potential (rather than actual impacts), and have noted some areas in which anecdotal evidence may be appropriate.

7.1 Estimating Job Creation

85. Before measuring good job creation, it is first necessary to estimate how many jobs (of any quality) have been created. Direct employment is the easiest to observe, and can be evaluated from project data. Targets for direct employment can be derived from the typical employment per dollar spent for projects of the same cost, technology and scale.[101] Indirect and induced employment can only be calculated if there is an input-output (IO) table available. An IO table identifies all supply sectors that link to the outputs of the project, and provides multipliers for the amount of direct, indirect, and induced employment resulting from the project.[102] IFC, for example, has developed an excel tool which can assess the impact of power sector projects in 20 developing countries. This tool is based on the social accounting matrix (SAM) multiplier methodology, which is an extension of an IO multiplier. This method adds other parts of the economy, and can also be used to derive second-order growth effects.[103] ADB has IO Tables developed for 17 countries, but these do not currently include CWA countries.[104] These tables may however be available through other sources. Examples of how IO tables have been used to link energy projects to job creation include estimates of the employment effects of RE projects in South Mediterranean Countries, RE policies in Portugal, and clean energy investments in Greece.[105][106][107] Studies such as these, which make use of IO tables are advantageous because they allow for the assessment of impacts in the sector being studied, as well as

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[101] Bacon, Robert, and Masami Kojima. "Issues in estimating the employment generated by energy sector activities." World Bank, http://siteresources. worldbank. org/INTOGMC/Resources/Measuring_the_employment_impact_of_energy_sector. pdf (2011).

[102] Bacon, Robert, and Masami Kojima. "Issues in estimating the employment generated by energy sector activities." World Bank, http://siteresources. worldbank. org/INTOGMC/Resources/Measuring_the_employment_impact_of_energy_sector. pdf (2011).

[103] IFC, "Power sector economic multiplier tool: Estimating the Broad Impact of Power Sector Projects: Methodology," (2015).

[104] ADB, "Input-Output Tables (IO Tables) for Selected DMCs," Accessed June 2016. http://www.adb.org/data/icp/input-output-tables.

[105] Juan Carlos Cisar Martinez, “Quantification of the Socio-economic Effects of Renewable Energy Technologies in Southern Mediterranean Countries: an Input-Output Evaluation,” Institute for Prospective Technological Studies, European Commission, (1998). http://ftp.jrc.es/EURdoc/eur18057en.pdf.

[106] Da Silva, P. Pereira, C. Oliveira, and D. Coelho. "Employment effects and renewable energy policies: applying I--O methodology to Portugal." (2012).

[107] Markaki, Maria, Athena Belegri-Roboli, Panayotis Michaelides, S. Mirasgedis, and D. P. Lalas. "The impact of clean energy investments on the Greek economy: An input–output analysis (2010–2020)." Energy Policy 57 (2013): 263-275.

related sectors and the wider economy. Difficulties involved with the use of IO tables include the high cost, the availability of an applicable model, lack of detail at a sub-sector level, and lack of insight into who is receiving the job benefits and the qualifications required to fill these jobs (i.e. if the jobs are good and inclusive).[108]

86. In the absence of a regional IO table or SAM, anecdotal evidence may be a suitable alternative. The potential for job creation can also be assessed through census data on the number of skilled and unskilled workers in the target area. Further, if major differences in impacts are expected based on the level of energy intensity (as would be the case for a project that improves voltage stability, for example), these numbers can be disaggregated for energy-intensive and non-energy-intensive sectors. In these cases, the size of the energy-intensive sectors is a good indicator of likely indirect and induced job creation. Table 7.1 summarizes potential indicators to use for measuring job creation.

[108] Intelligent Energy - Europe, "Employment Prediction and Methodology," (2009), https://www.wind-energy-the-facts.org/employment-prediction-and-methodology.html.

Table 7.1: Possible Indicators for Measuring Job Creation

Job Creation Impacts	Indicator(s)	Data Sources
Direct job creation	▪ Number of O&M and CIM jobs created for the project ▪ Number of O&M and CIM jobs (or job years) created per MW	Project records
Indirect job creation	▪ Number of jobs from goods or services sourced from other domestic businesses for the purpose of the project construction ▪ Number of indirect jobs (or job years) created per MW ▪ Number of skilled and unskilled workers in energy-intensive and non-energy intensive sectors of the target region	IO table or SAM Census data
Induced job creation	▪ Jobs created from additional spending from workers of new jobs. ▪ Number of induced jobs (or job years) created per MW	IO table or SAM
Jobs from second-order growth effects reliability	▪ Jobs created from increased access, quality, and reliability of energy. ▪ Number of second-order growth jobs (or job years) created per MW	SAM

87. Generic indicators for employment, systematically included in ADB's monitoring frameworks since 2010, include the number of people employed during construction, the number of people employed during operation, and the number of people indirectly employed as a result of the project.[109] Table 7.2 shows some examples of these indicators, used in past ADB projects.

Table 7.2: ADB Project Examples for Measuring Job Creation

ADB Project	Indicator	Result
ADB Mezzanine Finance for Climate Change	Jobs created from the program	72 jobs from solar, 30 from wind, and 60 from hydro;162 total (Estimates based on jobs per MW as listed in ADB's Private Sector Operations Department RE approvals from 2013-2015, and estimated MW)
The People's Republic of China: Zhangbei Wind Power Project	Direct and indirect jobs created from the program	500 construction jobs, 50 operational jobs, and 1,000 indirect jobs in the local manufacturing and service industries

Source: ADB, "Dedicated Private Sector Program (DPSP) II: Regional: ADB Mezzanine Finance for Climate Change, ADB response to the CTF Trust Fund Committee with regard to questions from the United Kingdom" (2015).

[109] ADB, "Development Effectiveness Report 2012: Private Sector Operations," (2013).

7.2 Estimating Good Job Creation

88. Once the creation of jobs has been measured, there are a series of indicators that could be used to identify whether the jobs are god. Direct jobs are the only ones which are easily observable, and for which it is possible to measure the various characteristics of good jobs, including payment, safety, and opportunities for growth. To determine whether direct jobs are well-paid, it is possible to calculate the average wage from project data. These data can be targeted against the national average wage (if available through census data). To assess safety, project data could include days of work missed due to injury on the job. Opportunity for growth—another characteristic sometimes included in definitions of "good jobs"—is difficult to quantify, but by assuming that skilled jobs offer more opportunity for training and income growth, the ratio of skilled to unskilled jobs could be used as a proxy. This indicator can be measured from project data, and can be targeted against the results of similar projects.

89. Whereas it may be too difficult and costly to look at good job attributes specifically for indirect, induced, and second-order growth jobs, it may be possible to look more generally at changes in poverty and vulnerable employment. It is difficult to show to what degree (if at all) these changes resulted from the energy sector intervention. In this case, one can only look at correlations and present a reasonable theory of change, but cannot determine exact impacts. It may also be more reasonable to observe the contributions of a sequence of interventions, rather than a single intervention.

90. Note that while some of these indicators are easy to measure with project data, others require data sources which may not be available. Where data are not available, anecdotal evidence may be a suitable alternative. Table 7.3 lists indicators that could be considered for measuring good job creation.

Table 7.3: Possible Indicators for Measuring Good Job Creation

Good Job Creation Impacts	Indicator(s)	Data Sources
Direct good job creation	▪ Average wage on the project compared to baseline of national average wage ▪ Days of work missed due to injuries on the job ▪ Ratio of skilled to unskilled jobs (for O&M and CIM)	Project data Census data
General good job creation	▪ Change in the percent of the population below the poverty line ▪ Change in the percent of vulnerable employment	Census data or World Bank Development Indicators

91. Table 7.4 provides an example of a good job indicator from a past ADB energy intervention in Pakistan.

Table 7.4: ADB Project Example for Measuring Good Job Creation

ADB Project	Indicator	Result
Pakistan Renewable Energy Development Sector Investment Program	Ratio of skilled to unskilled jobs	1:5 (The project was estimated to provide 100 skilled and 500 unskilled jobs, for the duration of 10 years[110])

7.3 Estimating Inclusive Growth Impacts

92. It is more challenging to measure inclusive growth than it is to measure job or good job creation, particularly because the impacts are large-scale and energy infrastructure projects are one of many drivers of growth. We can often only see correlations between the energy improvements and growth, and cannot determine exact causation. We can observe changes in GDP, the HDI, value lost due to electrical outages, and productivity as indicators of growth in general. Income inequality, measured through the Gini index, gives us a proxy for inclusive growth. Given these indicators, we can use a theory of change to draw conclusions about the energy intervention's (or sequence of interventions') contribution to growth and inclusive growth. These results must then be presented in a way that is transparent about the uncertainty involved, and the lack of knowledge about the size of the contribution. However, for direct jobs (and sometimes also for indirect jobs) there are a few simple measures of inclusivity, listed in Table 7.5, that use project data to determine how many jobs are allocated to disadvantaged populations. It may also be sufficient to look at the composition of the population in the target area, and gauge likely impacts based on the presence of firms, poor households, and disadvantaged groups in the rural and urban areas expected to be impacted by the project.

[110] Hansen, Stein. "ADB's Contribution to Inclusive Growth in Transport and Energy Projects." (2010).

Table 7.5: Possible Indicators for Measuring Inclusive Growth

Inclusive Growth Impacts	Indicator(s)	Data Sources
General growth indicators	▪ Change in GDP	The World Bank Open Data
	▪ Change in Human Development Index	United Nations Development Programme
	▪ Change in value lost due to electrical outages	The World Bank Open Data
	▪ Labor productivity per hour worked ▪ Labor productivity per person employed	The Conference Board Total Economy Database
Income inequality	▪ Change in Gini coefficient	The World Bank Open Data
Provision of good jobs to disadvantaged populations	▪ Percent of direct jobs allocated to women, indigenous people, and other disadvantaged groups (for CIM and O&M) ▪ Percent of direct jobs allocated to unskilled workers (both unskilled jobs and skilled jobs with training) ▪ Percent of the project's domestic goods/services providers owned by a member of a disadvantaged group (i.e. woman, rural business owner, etc.)	Project data Census data
Potential for inclusive growth impacts	▪ Total population in the target area, number of firms/industries, number of poor households, females, indigenous people, or other disadvantaged groups (all disaggregated between rural and urban)	Census data

93. When high-level impacts (for example, economic growth) are measured, the DMF may include measures like those above or measures for the cause for the impact (rather than the impact itself). In some instances, no measures are included, as they are not required for impacts, unlike outputs and outcomes. Table 7.6 shows examples of indicators from past ADB projects, along with the data sources which would be used to measure progress toward each performance indicator.

Table 7.6: ADB Project Examples for Measuring Growth and Inclusive Growth

ADB Project	Impact	Data Sources	Performance Indicator
Azerbaijan: Azerenerji JSC Janub Gas-Fired Power Plant Project	Power system in Azerbaijan provides efficient, reliable and adequate electricity for sustained economic growth	Annual national statistics report Statistics regularly produced by AzerEnergy Project quarterly progress reports ADB project completion reports	By 2016, in 5 years after the Project completion The frequency and duration of forced outages will be reduced by 40 times, from 8-10 times per year to 0.2 times by 2012. Annual net CO_2 emission is reduced by 1.3 million ton by 2012.
BHU: Rural Renewable Energy Development Project	Sustained inclusive economic growth through reliable and affordable clean energy services	Government statistical and census reports Government 5-year plans UNDP Bhutan annual report (for Millennium Development Goals) Economic reports of the government, ADB, IMF, and the World Bank	Increase in the energy sector share of GDP from 25% (2007) to 40% (2017) Reduced proportion of people living below the national poverty line from 23.2% (2007) to 20.0% (2015) Diversification of energy supply sources through renewable energy including solar, wind, and biogas up to additional 70 MW equivalent by 2020 Maintained proportion of forestry area (72.5%) in the country Reduction of domestic use of fuelwood by 30% from the 2005 consumption level by 2020

Sources: ADB, "Draft Design and Monitoring Framework, Proposed Credit Guarantee Republic of Azerbaijan: Azerenerji JSC Janub Gas-Fired Power Plant Project", (2009). ADB, "Draft Design and Monitoring Framework, BHU: Rural Renewable Energy Development Project", (2010).

Appendix A: Definitions and Descriptions of "Good Jobs" and "Inclusive Growth"

A.1 Defining Good Jobs

1. May of the organizations which aim to promote "good jobs" each have their own definitions of what makes a job "good", and what outcomes these jobs should have for both the individual holding the job and for the society or country as a whole. Appendix Table A.1 lists several definitions of good jobs from organizations including ADB, the World Bank, and ILO.

Appendix Table A.1: Definitions of "Good Jobs"

Asian Development Bank	Good Jobs are defined as jobs which are well-paid, productive, and safe. These kinds of jobs help to further economic growth and improve income distribution.
The World Bank	"From the worker's perspective, a good job is a job leading to a higher standard of living, that is, a job that provides higher earnings and greater potential for growth in earnings and higher satisfaction. From the country's perspective, good jobs are jobs whose productivity is above the country's average, jobs with greater productive externalities, and jobs with potential for productivity growth."
International Labor Organization (ILO)	"Decent work sums up the aspirations of people in their working lives. It involves opportunities for work that is productive and delivers a fair income, security in the workplace and social protection for families, better prospects for personal development and social integration, freedom for people to express their concerns, organize and participate in the decisions that affect their lives and equality of opportunity and treatment for all women and men."

Sources: Javorcik, Beata. 2012. Does FDI Bring Good Jobs to Host Countries?. Background Paper for the World Development Report 2013;. World Bank, Washington, DC. © World Bank. https://openknowledge.worldbank.org/handle/10986/12132

http://www.ilo.org/global/topics/decent-work/lang--en/index.htm

2. In addition to the World Bank's definition above, their "World Development Report 2013: Jobs" also sets out a framework for valuing jobs. This framework is based on effects the job has on the individual (earnings, benefits, and satisfaction), along with spillover positive/negative effects at a social level (impacts on others' living standards and productivity, and on social cohesion). Under this framework, a type of job cannot be labeled as good or bad overall, but rather it is examined under the context of the specific needs of the country.[111]

[111] World Bank. 2012. World Development Report 2013 : Jobs. World Development Report.Washington, DC. © World Bank. https://openknowledge.worldbank.org/handle/10986/11843 License: CC BY 3.0 IGO.

3. There are several reoccurring themes in these definitions of good jobs, which we will use in our analysis. On an individual level, good jobs are well-paid (including security and reliability of payments), safe, and provide opportunities for personal development and income growth. These jobs also have higher worker satisfaction. However, for our purposes, we want to focus on easily measurable features of good jobs, and thus will not go into detail about job satisfaction. On a societal or country level, good jobs promote productivity, provide equality of opportunities, and promote a more equal income distribution. These outputs all align with the idea of inclusive growth, which we define in the next subsection.

A.2 Defining Inclusive Growth

4. Economic growth is defined as an increase in the productive capacity of an economy. Inclusive growth means that the new opportunities arising from this economic growth are equally available to everyone, given the same level of individual effort. Under inclusive growth, people of different locations (i.e. urban/rural), ethnic backgrounds, genders, ages, etc. are given equal opportunities. In short, inclusive growth is "growth coupled with equality of opportunities", as defined by ADB.[112] Appendix Table A.2 lists several other definitions for inclusive growth from the Organization for Economic Cooperation and Development and the World Economic Forum.

Appendix Table A.2: Definitions of "Inclusive Growth"

OECD	"Inclusive growth is economic growth that creates opportunity for all segments of the population and distributes the dividends of increased prosperity, both in monetary and non-monetary terms, fairly across society."
World Economic Forum	"Inclusive growth has been defined as output growth that is sustained over decades, is broad-based across economic sectors, creates productive employment opportunities for a great majority of the country's working age population, and reduces poverty"

Sources: OECD, "Inclusive Growth," Accessed June 28, 2016. http://www.oecd.org/inclusive-growth/.

Samans, Richard, Jennifer Blanke, Gemma Corrigan, and Margareta Drzeniek. "The Inclusive Growth and Development Report 2015." In Geneva, Switzerland: World Economic Forum. 2015.

[112] ADB, " Good Jobs for Inclusive Growth in Central and West Asia," (2015).

Appendix B: Energy Sector Challenges in the CWA Region

B.1 Energy Sector in CWA

1. In order to assess the impact of energy interventions in CWA, it is important to know what the current problems are that require interventions. The following subsections give an overview of the energy sector in each country, including levels of access, reliability, cost, affordability, energy intensity, and supply and demand gaps.

B.1.1 Access

2. The region overall has good access to electricity, with roughly 100 percent of the population having access in most countries, as of 2012. Appendix Table B.1 shows the percent of the population in each country with access to electricity, as of 2012.

Appendix Table B.1: Percent of population with access to electricity (2012)

Country	Total	Urban	Rural
Kazakhstan	100.0	100	100
Kyrgyzstan	100.0	99.8	100
Tajikistan	100.0	99.8	100
Turkmenistan	100.0	100	100
Uzbekistan	100.0	100	100
Armenia	100.0	99.8	100
Azerbaijan	100.0	100	100
Georgia	100.0	100	100

Source: World Bank, "World DataBank, World Development Indicators," Washington, D.C.: The World Bank. http://databank.worldbank.org/data/home.aspx.

3. Although access is seemingly not a problem, it is important to remember that even with roughly 100 percent access, there can still be many disadvantaged people left behind. In Georgia for example, although connectivity is roughly 100 percent, there are still about 2,000 households, primarily in mountain villages, which either have off-grid electricity or no electricity.[113] Tajikistan, which also has roughly 100 percent connectivity, has limited access in rural areas, which results in annual damage of 30% of agricultural production and the closure of about 850 SMEs.[114]

B.1.2 Reliability and Quality

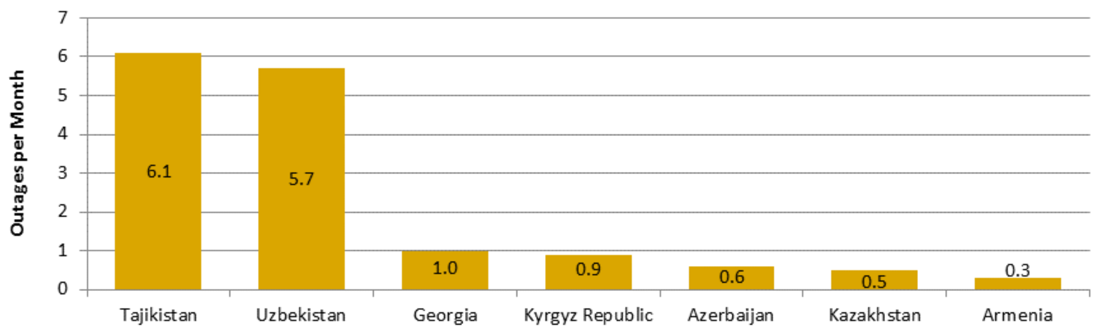
4. Poor reliability and quality are a more common problem in the region. Outages and voltage and frequency fluctuations can result in loss of business productivity for those without alternative power sources, high costs of backup power, and damage to equipment and appliances at work and at home.

5. Outages cost businesses both money spent on backup generation and opportunity costs of time that could have been spent doing activities which involve electricity. [115] Appendix Figure B.1 Appendix Figure B.1 shows power outages for firms in a typical month and Appendix Figure B.2 shows value lost as a result of these

[113] ADB, "Assessment of Power Sector Reforms in Georgia: Country Report", 2015.
[114] Sustainable Energy for All, "Tajikistan: Rapid assessment and gap analysis," (2013).
[115] DHInfrastructure, “Independent Evaluation of SECO Development Cooperation in the Energy Sector in Eastern Europe and Central Asia,” (2010).

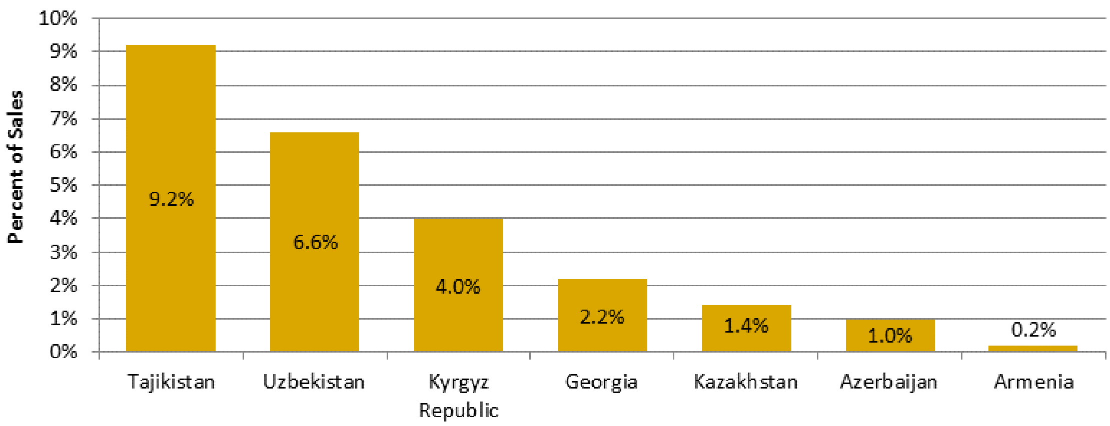
outages. Tajikistan suffers the most loss, with an average of 6.1 outages per month and losses of 9.2 percent of sales. Armenia experiences the smallest costs of outages, losing only 0.2 percent of sales.

Appendix Figure B.1: Number of Power Outages in Firms in a Typical Month (2013)



Source: "Power outages in firms in a typical month (number)", World Bank, Enterprise Surveys (http://www.enterprisesurveys.org/).

Appendix Figure B.2: Value Lost Due to Electrical Outages (% of Sales, 2013)



Source: "Value lost due to electrical outages (% of sales)", World Bank, Enterprise Surveys (http://www.enterprisesurveys.org/).

6. Voltage and frequency fluctuations are another major concern for businesses, as they can damage energy-intensive appliances and equipment.[116] The costs of outages and poor quality combined can often be more important to the overall costs of a business than the price of the energy itself. The cost of energy is typically a small fraction of production costs, but the damages resulting from voltage changes or production loss due to blackouts can be very costly.[117]

7. Reliability and quality are a key constraint on businesses. In the Kyrgyz Republic, the poor reliability of power has been identified as a top concern for businesses, and a constraint for growth.[118] There, the seasonality of hydropower along

[116] DHInfrastructure, "Independent Evaluation of SECO Development Cooperation in the Energy Sector in Eastern Europe and Central Asia," (2010).

[117] Pueyo, Ana. "The Evidence of Benefits for Poor People of Increased Renewable Electricity Capacity: Literature Review." (2013).

[118] ADB, "The Kyrgyz Republic Strategic Assessment of the Economy: Promoting Inclusive Growth," (2014).

with aging infrastructure caused rolling blackouts for several months in 2008, and country-wide blackouts in 2012. These blackouts, along with voltage and frequency fluctuations caused damage to appliances and electrical equipment.[119]

8. Appendix Table B.2 shows a variety of quality indicators as they relate to businesses, including a rank of the ease of getting a connection, the number of days to receive a permanent connection, the total cost to connect, and an index of reliability of supply and transparency of tariffs. In the region, Georgia is ranked the highest for ease of getting electricity, and Tajikistan is ranked the lowest.

Appendix Table B.2: Ease of Getting Electricity, Reliability and Transparency for Businesses

Country	Rank (Ease of getting electricity)	Number of days to obtain a permanent electricity connection	Cost to connect a warehouse to electricity (% of income per capita)	Reliability of supply and transparency of tariff index (0-8)
Georgia	39	71	354	6
Kazakhstan	75	77	50.6	7
Armenia	76	138	80.3	5
Azerbaijan	105	69	150.4	4
Uzbekistan	83	89	1,232.5	8
Kyrgyz Republic	163	125	858.1	0
Tajikistan	173	133	742.5	0

Source: World Bank, "Doing Business project; Getting Electricity," June 2016. (http://www.doingbusiness.org/).

Note: "The reliability of supply and transparency of tariffs index encompasses quantitative data on the duration and frequency of power outages as well as qualitative information on the mechanisms put in place by the utility for reporting power outages and restoring power supply, the reporting relationship between the utility and the regulator for power outages, the transparency and accessibility of tariffs and whether the utility faces a financial deterrent aimed at limiting outages (such as a requirement to compensate customers or pay fines when outages exceed a certain cap)."

9. Poor reliability and quality also have negative effects for households, which further results in employment impacts. A lack of energy reliability impacts the use of household appliances. Labor saving appliances can help to alleviate time poverty, particularly for women, who are generally responsible for cooking, cleaning, and laundry.[120] This time poverty impacts available time for employment.

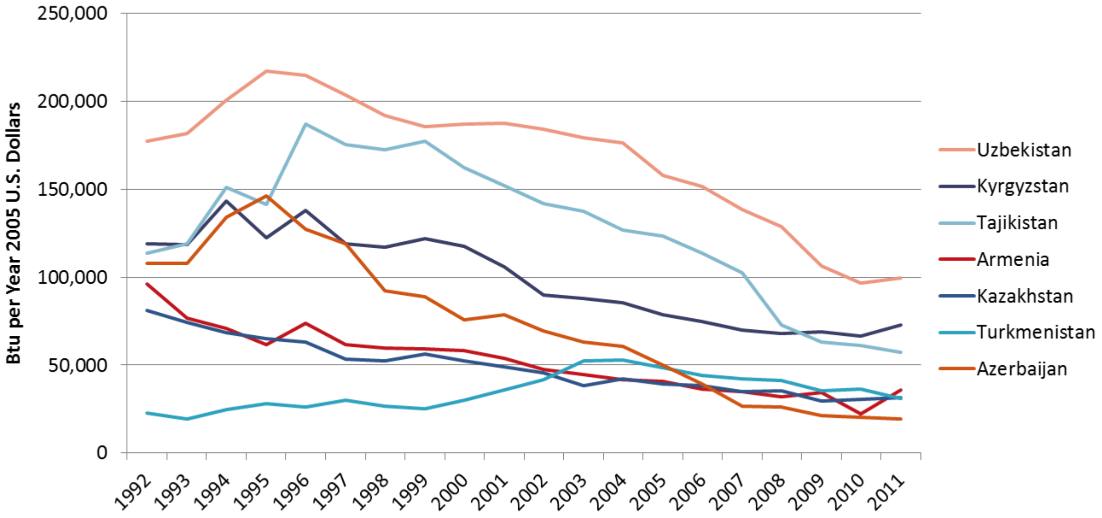
B.1.3 Energy Intensity

10. Of the countries with available energy intensity data, Uzbekistan, Kyrgyzstan, and Tajikistan rank as the three most energy-intensive countries (as of 2011). Further, Uzbekistan is the second most energy-intensive country in the world.[121] Despite still having high energy intensity, these countries have made substantial progress, with

[119] ADB, "The Kyrgyz Republic Strategic Assessment of the Economy: Promoting Inclusive Growth," (2014).
[120] Duban, Elisabeth, "REG: Promoting Gender-Inclusive Growth in Central and West Asia Developing Member Countries, Country Gender Assessment: Uzbekistan," ADB. (2012).
[121] Duban, Elisabeth, "REG: Promoting Gender-Inclusive Growth in Central and West Asia Developing Member Countries, Country Gender Assessment: Uzbekistan," ADB. (2012).

energy intensity decreasing by 44, 39, and 50 percent respectively since 1992. All countries in the CWA region have shown downward trends in energy intensity, with the exception of Turkmenistan, which has had a 38 percent increase since 1992. Appendix Figure B.3 shows the energy intensity of countries in the CWA region.

Appendix Figure B.3: Energy Intensity - Total Primary Energy Consumption per Dollar of GDP



Source: EIA, "Energy Intensity - Total Primary Energy Consumption per Dollar of GDP (Btu per Year 2005 U.S. Dollars (Market Exchange Rates))", https://www.eia.gov/cfapps/ipdbproject/iedindex3.cfm?tid=92&pid=46&aid=2&cid=regions&syid=1990&eyid=2011&unit=BTUPUSDM.

B.1.4 Cost and Affordability

11. Energy utilities in the region are typically not recovering the full costs of energy in tariffs, and as a result often face poor financial performance. In Kyrgyzstan, for example, tariffs do not recover costs, and are rather set to be affordable. Tariffs were doubles in 2010, but were later reduced due to social unrest. The low tariffs, combined with increasing costs from capital expenditures, high losses, and debt accumulated due to periods of poor collection rates, all result in the sector's poor financial performance.[122]

12. Appendix Table B.3 describes the energy subsidies for Azerbaijan, Kazakhstan, Turkmenistan, and Uzbekistan in 2014. Appendix Figure B.4depicts the costs of those subsidies, including oil, electricity, gas, and coal. Uzbekistan had the greatest cost of energy subsides, at about 9 billion USD, with an average energy subsidization rate of 58.8 percent. The low tariffs paid by Uzbekistan's energy consumers result in a lack of incentive to conserve. [123] Turkmenistan has the highest average subsidization rate (68.4 percent), the highest subsidy per capita (1474 $/person) and the highest total subsidy as a share of GDP (16.3 percent). In Turkmenistan, there is a free electricity ration for households, which used to allow for

[122] ADB, "Country Partnership Strategy: Kyrgyz Republic, 2013-2017, Sector Assessment (Summary): Energy"

[123] Duban, Elisabeth, "REG: Promoting Gender-Inclusive Growth in Central and West Asia Developing Member Countries, Country Gender Assessment: Uzbekistan," ADB. (2012).

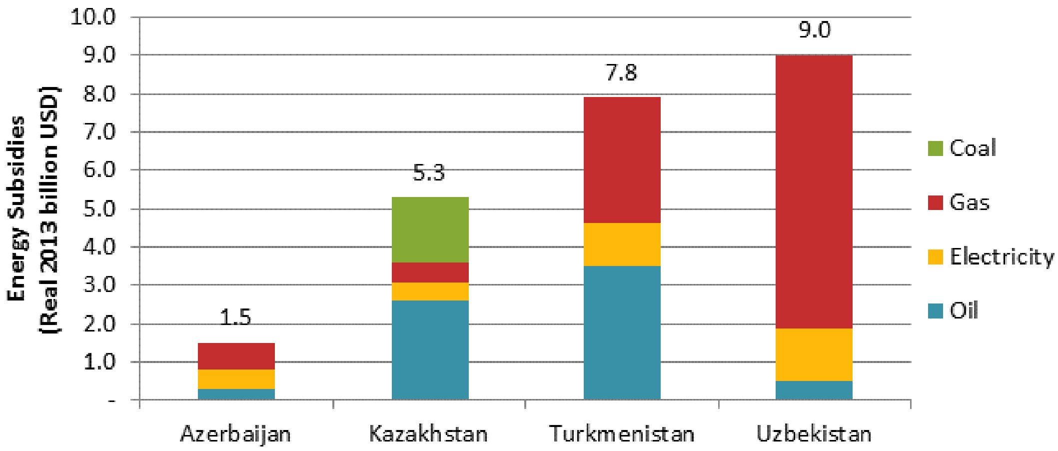
35kW of free electricity per month, but has been decreased since 2013 in order to meet export commitments.[124]

Appendix Table B.3: Energy Subsidies (2014)

Country	Total oil, electricity, gas, and coal subsidies (billion USD)	Average subsidization rate (%)	Subsidy per capita ($/person)	Total subsidy as share of GDP (%)
Azerbaijan	$1.5	23.6%	$154	2.0%
Kazakhstan	$5.3	31.9%	$309	2.5%
Turkmenistan	$7.8	68.4%	$1474	16.3%
Uzbekistan	$9.0	58.8%	$293	14.3%

Source: OECD/IEA, "IEA fossil-fuel subsidies database," (2015), http://www.worldenergyoutlook.org/resources/energysubsidies/.

Appendix Figure B.4: Energy Subsidies, Including Oil, Electricity, Gas, and Coal (2014)



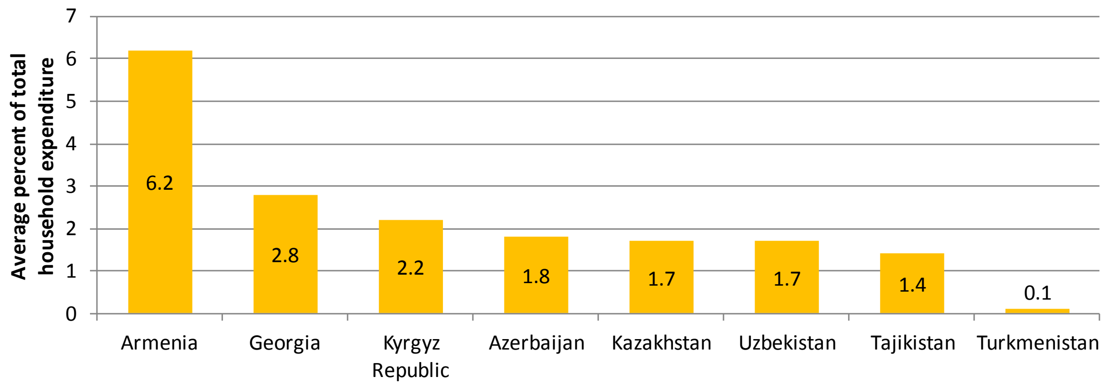
Source: OECD/IEA, "IEA fossil-fuel subsidies database," (2015), http://www.worldenergyoutlook.org/resources/energysubsidies/.

13. Although tariffs in the region are typically not high enough to recover costs, the affordability of these tariffs for customers is still a concern. Appendix Figure B.5 shows affordability of electricity as an average percent of total household expenditures. Turkmenistan's electricity is the most affordable, with electricity only comprising 0.1 percent of household expenses. Armenia's electricity is the least affordable, accounting for 6.2 percent of household expenses. Although there is no exact affordability cutoff for electricity payments, some former Soviet states have housing subsidies, based on an affordability limit of 15-30 percent of income for housing and utility expenses combined.[125]

[124] Daly, John, "Energy-Rich Turkmenistan Slashes Subsidies to Consumers," Silk Road Reportes. (2014). http://www.silkroadreporters.com/2014/12/08/energy-rich-turkmenistan-slashes-subsidies-consumers/.

[125] Komives, Kristin. "Water, electricity, and the poor: Who benefits from utility subsidies?". World Bank Publications, 2005.

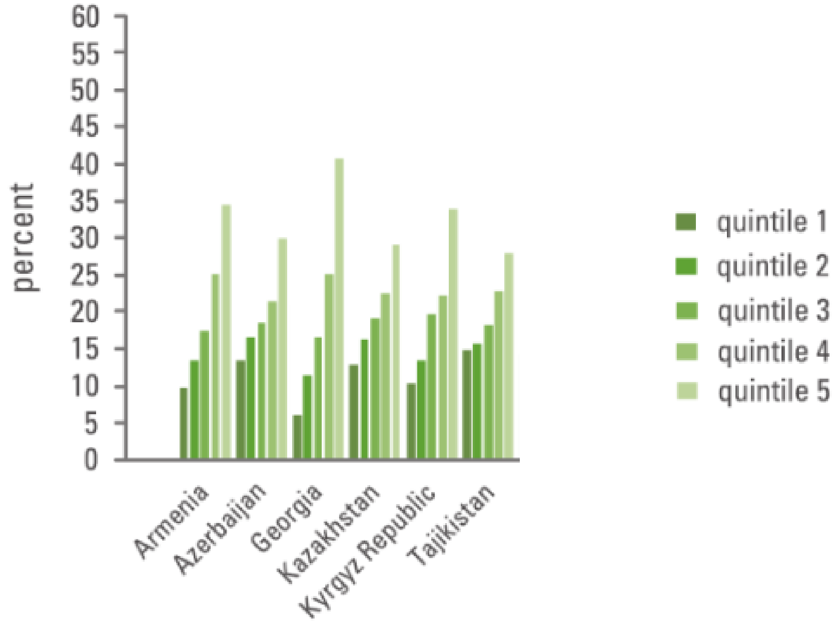
Appendix Figure B.5: Electricity Affordability (2007)



Source: Fankhauser, Samuel, and Sladjana Tepic. "Can poor consumers pay for energy and water? An affordability analysis for transition countries." Energy Policy 35, no. 2 (2007): 1038-1049.

14. Affordability concerns are amplified where energy subsidies are not well targeted to reach poor consumers. While universal subsidies reach the poor, they also provide unnecessary savings for non-poor households. These poorly targeted subsidies are inefficient for utilities, and also absorb funds that could have otherwise been used to further benefit the poor. In addition, these subsidies are unsustainable as the need for investments increases and the cost of service goes up.[126] Appendix Figure B.6 shows an estimate of the percentage of the implicit subsidy reaching each quintile, for six CWA countries. In each country, the fifth quintile (the wealthiest 20% of households) is estimated to receive more benefits from the implicit subsidies than the first quintile (the poorest 20% of households).

Appendix Figure B.6: Targeting of the Implicit Subsidy on Electricity and Gas, by Quintile



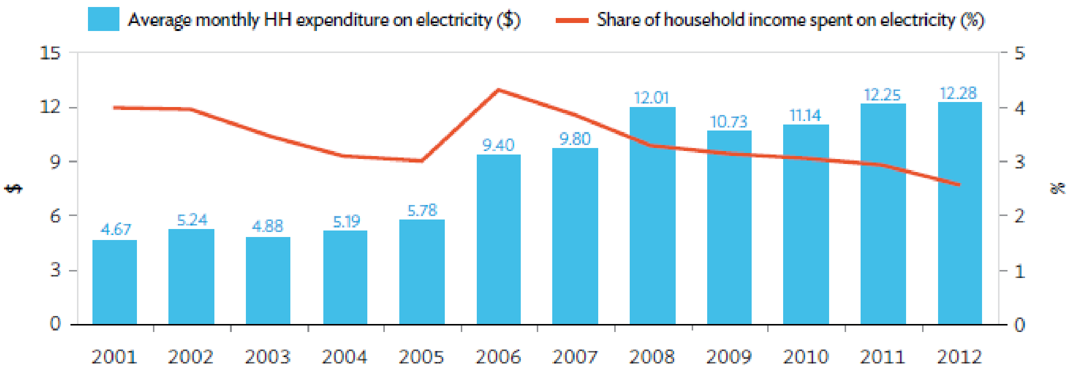
Note: These are simplified estimates. The values of the subsidies are estimated as the difference between the cost-recovery price and average tariffs.

[126] Laderchi, Caterina Ruggeri, Anne Olivier, and Chris Trimble. "Balancing act: Cutting energy subsidies while protecting affordability." World Bank Publications, 2013.

Source: Laderchi, Caterina Ruggeri, Anne Olivier, and Chris Trimble. "Balancing act: Cutting energy subsidies while protecting affordability." World Bank Publications, 2013.

15. Energy is becoming more affordable in some parts of the region, due to increasing incomes. In Georgia, where electricity comprised less than 3 percent of household income in 2013, affordability is not a major concern. Monthly electricity expenditures have been increasing, but incomes have also been increasing, causing the share of income spent on electricity to steadily decrease since 2006 (See Appendix Figure B.7).[127]

Appendix Figure B.7: Georgia Electricity Expenditures as a Share of Household Income



Source: ADB, "Figure 4.9: Average Electricity Expenditures as a Share of Total Household Income, 2001–2012" from, "Assessment of Power Sector Reforms in Georgia: Country Report", (2015).

16. In other areas, affordability presents major concerns for poor households. In Armenia, affordability has become a greater concern since the 2007 numbers presented in Appendix Figure B.5. Energy costs now account for 10 percent of household expenses and the cost is expected to rise as necessary investments are made. The increase in gas and electricity tariffs, which occurred in 2013, is estimated to have increased poverty by 3 percent, even with a gas subsidy. Energy affordability is of the greatest concern during heating season. To cope with high energy prices, poor households have cut back on other important expenses such as healthcare and education, and have burned furniture, clothing or manure (in rural areas) rather than purchasing wood. For these households, further reductions in energy consumption could have major health implications.[128]

17. Affordability is also a problem in Tajikistan, despite electricity tariffs being the second lowest in Europe and Central Asia. Here, affordability concerns are driven by low incomes, and increased electricity expenses during the heating season. The poorest quintile in rural areas of Tajikistan spends an average of 14 percent of their household expenditures on electricity year-round, and 25 percent during the heating season. [129]

B.1.5 Supply and Demand Gap

18. Supply and demand gaps can be caused by aging infrastructure, seasonal variation in generation capacity (particularly hydropower in the CWA region), and lack of incentive for conservation. Kyrgyzstan, Georgia, Kazakhstan, Tajikistan, and Uzbekistan face seasonal shortages, for which they rely on imports. Armenia has

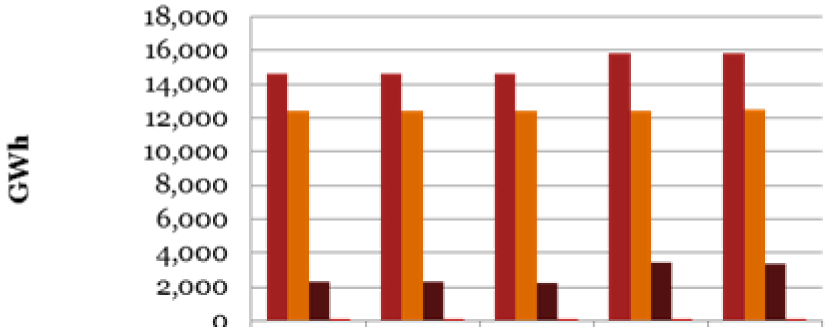
[127] ADB, "Assessment of Power Sector Reforms in Georgia: Country Report", 2015.
[128] World Bank, "Armenia Power Sector Policy Note", 2014.
[129] World Bank, "Assessment of Household Energy Deprivation in Tajikistan", 2014.

shown some recently emerging supply shortages, and Turkmenistan and Azerbaijan are both exporters which face no supply demand gap.

Kyrgyzstan

19. In Kyrgyzstan, the supply and demand gap is most problematic in the winter, when demand for electricity increases due to heating, and hydropower output is low.[130] Aging infrastructure is also a problem, especially in the context of increasing demand. Coal, oil, and gas imports for fueling thermal plants help to close the supply gap, but rehabilitation of energy infrastructure is also necessary.[131] Appendix Figure B.8 shows a forecast of Kyrgyzstan's generation, demand, exports and imports.

Appendix Figure B.8: Energy Generation/Demand vis a vis Exports, Kyrgyzstan



	2016	2017	2018	2019	2020
Generation GWh	14630	14630	14630	15830	15830
Demand GWh	12407	12425	12441	12456	12520
Export GWh	2323	2305	2289	3474	3410
Import GWh	100	100	100	100	100

Source: Consultants Report, "ADB TA-8727 REG: Research and Development Technical Assistance for Study for a Power Sector Financing Road Map within Central Asia Regional Economic Cooperation," *ADB*, (2016).

Georgia

20. Georgia is a net energy exporter. However, despite a surplus of energy in the summer, Georgia faces a supply and demand gap in the winter, due to insufficient water flow for hydropower generation. This deficit is bridged through the use of thermal power and imports from Azerbaijan.[132] Georgia's gas dependence on Azerbaijan has been increasing, and is expected to eventually reach 50 percent of total energy supplied.[133]

Kazakhstan

21. In Kazakhstan, the supply demand gap is primarily a problem in the winter, and has gotten worse in recent years due to an increase in electricity consumption resulting from rapid economic growth. Aging equipment and lack of maintenance is also a contributing factor, with 19.8 GW of installed capacity and only 15 GW of available capacity.[134] Kazakhstan also has regional differences, with a surplus of power in the

[130] The World Bank, "Keeping Warm: Urban Heating Options for the Kyrgyz Republic," February 25, 2015, http://www.worldbank.org/en/news/feature/2015/02/25/urban-heating-options-for-the-kyrgyz-republic.

[131] ADB, "The Kyrgyz Republic Strategic Assessment of the Economy: Promoting Inclusive Growth," (2014).

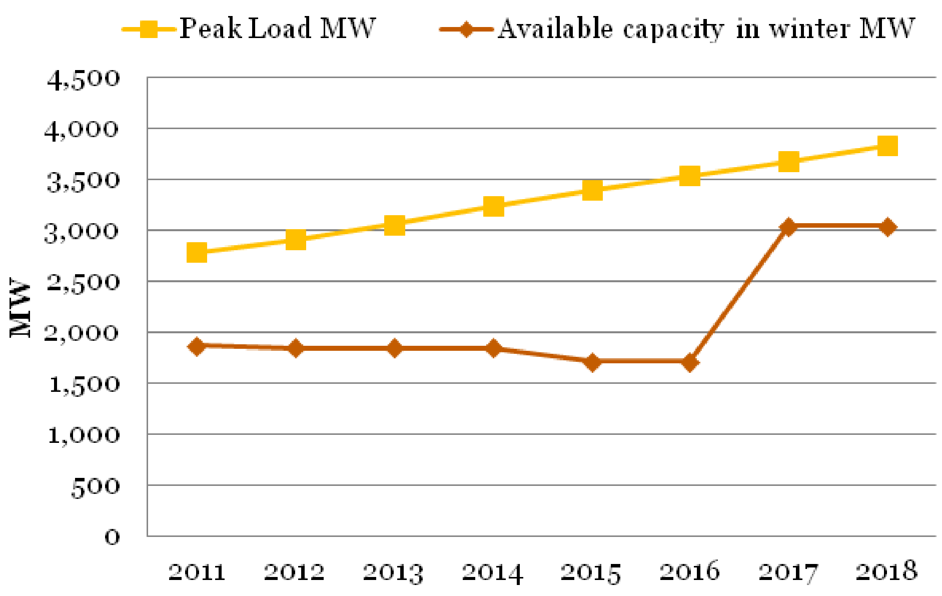
[132] Bank of Georgia Research, "Georgia's Hydropower Potential, Giving water the green light," (2012).

[133] USAID, "Energy Strategy of Georgia (2015-2030)," (2014).

[134] Karatayev, Marat, and Michèle L. Clarke. "Current energy resources in Kazakhstan and the future potential of renewables: A review." Energy Procedia 59 (2014): 97-104.

Northern region, and a deficit in the Southern region. The transmission system between the two regions, consisting of only a 500 kV power line, is insufficient to even out the supply, and as a result 15 percent of power has to be imported from Russia to close this gap.[135] Appendix Figure B.9 shows a forecast of South Kazakhstan's peak load and available capacity.

Appendix Figure B.9: Peak Load vs. Available Capacity, South Kazakhstan



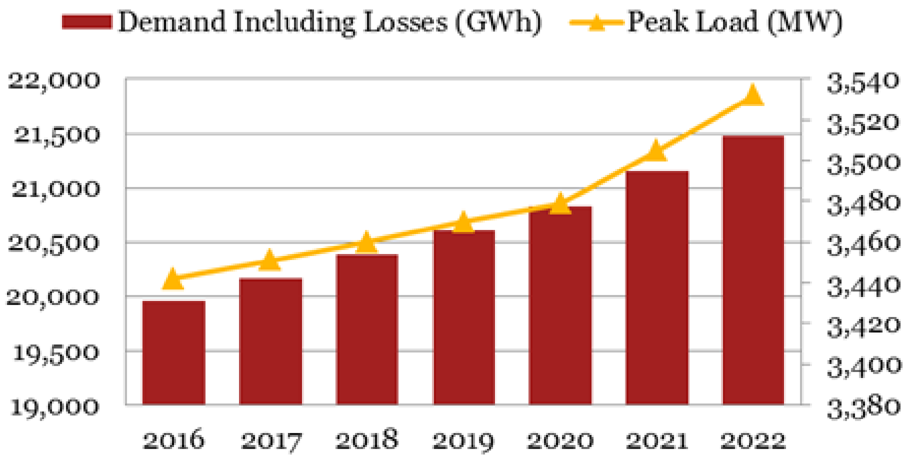
Source: Consultants Report, "ADB TA-8727 REG: Research and Development Technical Assistance for Study for a Power Sector Financing Road Map within Central Asia Regional Economic Cooperation," *ADB*, (2016).

Tajikistan

22. In Tajikistan, energy is a large portion of the economy, representing 60 percent of GDP. However, it relies heavily on hydropower, which provides over 90 percent of the country's demand. As a result, Tajikistan faces a deficit in autumn and winter. During the winter, rural areas only receive electricity for up to 3 hours a day. To lesson this deficit, Tajikistan imports fuels to cover 70 percent of its winter energy demand. [136] The country has also faced deficits due to the loss of electricity and gas imports since 2009.[137] Appendix Figure B.10 shows a forecast of Tajikistan's demand and peak load.

[135] Consultants Report, "ADB TA-8727 REG: Research and Development Technical Assistance for Study for a Power Sector Financing Road Map within Central Asia Regional Economic Cooperation," ADB, (2016).
[136] Sustainable Energy for All, "Tajikistan: Rapid Assessment and Gap Analysis," (2013), http://www.tj.undp.org/content/tajikistan/en/home/library/environment_energy/sustainable-energy-for-all.html.
[137] Fields, Daryl, Artur Kochnakyan, Gary Stuggins, and John Besant-Jones. "Tajikistan's Winter Energy Crisis: Electricity Supply and Demand Alternatives." (2012).

Appendix Figure B.10: Demand and Peak Load, Tajikistan



Source: Consultants Report, "ADB TA-8727 REG: Research and Development Technical Assistance for Study for a Power Sector Financing Road Map within Central Asia Regional Economic Cooperation," *ADB*, (2016).

Uzbekistan

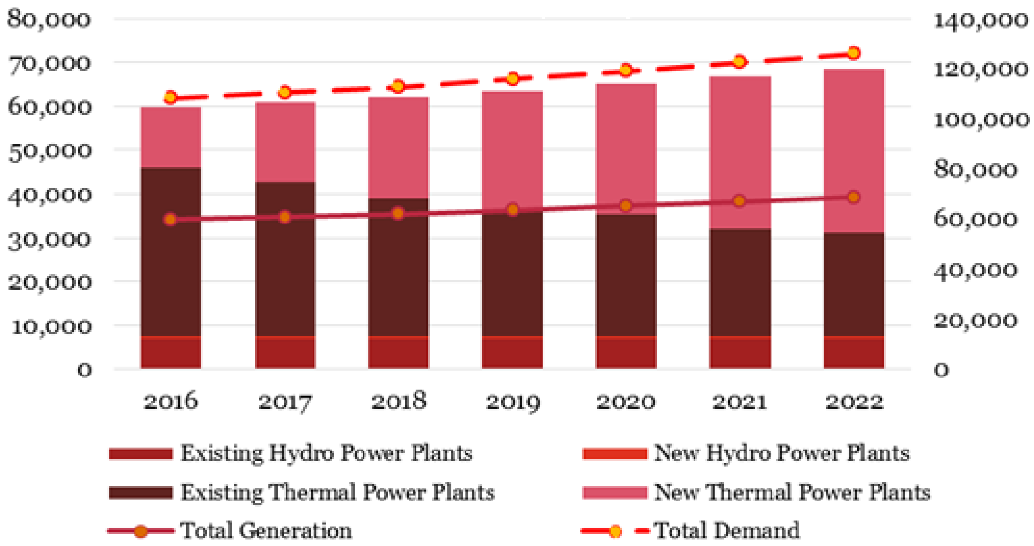
23. In Uzbekistan, a supply demand gap has resulted due to poor infrastructure, transmission bottlenecks, lack of conservation, and lack of renewable energy use.[138] [139] This deficit is most problematic in the winter, due to demand for heating. Supply interruptions during the winter months can cause some households go most of the day without power. In both rural and urban areas, load curtailment can last for 2-6 hours per day.[140] Appendix Figure B.11 shows a forecast of Uzbekistan's generation and demand.

[138] Duban, Elisabeth, "REG: Promoting Gender-Inclusive Growth in Central and West Asia Developing Member Countries, Country Gender Assessment: Uzbekistan," ADB. (2012).

[139] Consultants Report, "ADB TA-8727 REG: Research and Development Technical Assistance for Study for a Power Sector Financing Road Map within Central Asia Regional Economic Cooperation," ADB, (2016).

[140] Consultants Report, "ADB TA-8727 REG: Research and Development Technical Assistance for Study for a Power Sector Financing Road Map within Central Asia Regional Economic Cooperation," ADB, (2016).

Appendix Figure B.11: Energy Generation vis a vis Demand Forecast (GWh), Uzbekistan



Source: Consultants Report, "ADB TA-8727 REG: Research and Development Technical Assistance for Study for a Power Sector Financing Road Map within Central Asia Regional Economic Cooperation," *ADB*, (2016).

Armenia

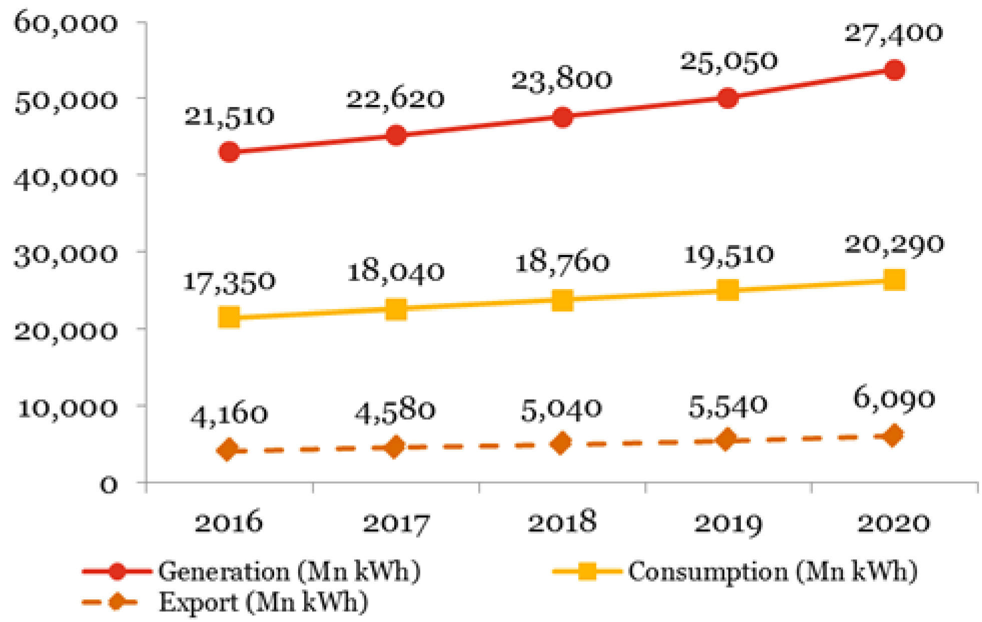
24. In Armenia, a demand and supply gap is emerging due to both steady demand growth and aging infrastructure. [141] It is estimated that Armenia will need to add 500 MW of gas-fired generation capacity, in order to prevent a supply demand gap by 2020. [142] Further, the nuclear power plant, which accounts for 30 percent of domestic energy production, is expected to retire in 2026, meaning that new capacity will have to be added.[143] Armenia currently imports fuels to maintain a reliable supply. [144]

Turkmenistan

25. Turkmenistan is a net exporter of energy and does not have a supply and demand gap. The country has the fourth-largest natural gas reserves in the world, which accounts for about 78 percent of total energy consumption. All of the country's power generation is gas-fired. Turkmenistan exports natural gas primarily to China and Russia, with China receiving more than half of the exports. In the future, Turkmenistan is not expected to develop a supply and demand gap, and income from energy exports is expected to increase. [145] Appendix Figure B.12 shows a forecast of Turkmenistan's generation, consumption, and exports.

[141] Balabanyan, Ani. et al. "Charged Decisions: Difficult Choices in Armenia's Energy Sector." World Bank. Sustainable Development Department Europe and Central Asia Region. (2011).
[142] World Bank, "World Bank Helps to Further Strengthen Power Supply Reliability in Armenia," (2015). http://www.worldbank.org/en/news/press-release/2015/03/30/world-bank-strengthen-power-supply-reliability-armenia.
[143] EBRD, "Strategy for Armenia," (2015).
[144] Balabanyan, Ani. et al. "Charged Decisions: Difficult Choices in Armenia's Energy Sector." World Bank. Sustainable Development Department Europe and Central Asia Region. (2011).
[145] Daly, John. "Energy-Rich Turkmenistan Slashes Subsidies to Consumers," Silk Road Reporters, (2014). http://www.silkroadreporters.com/2014/12/08/energy-rich-turkmenistan-slashes-subsidies-consumers/.

Appendix Figure B.12: Power Generation vis a vis Export Forecast, Turkmenistan



Source: Consultants Report, "ADB TA-8727 REG: Research and Development Technical Assistance for Study for a Power Sector Financing Road Map within Central Asia Regional Economic Cooperation," *ADB*, (2016).

Azerbaijan

26. Like Turkmenistan, Azerbaijan is a natural gas exporting country with no supply and demand gap. [146] The country's generation capacity increased more than 30 percent from 2007 to 2013. Even with a significant portion of installed capacity not available through the year and non-operating hours for repairs and maintenance, Azerbaijan has enough supply to meet demand. Azerbaijan exports energy to Russia, Iran, Georgia, and Turkey.[147]

[146] Mammadova, Sevinj. "Azerbaijan's energy policy: Natural Gas supply to Europe," *Berlin Center for Caspian Region Studies, Free University of Berlin.*

[147] Consultants Report, "ADB TA-8727 REG: Research and Development Technical Assistance for Study for a Power Sector Financing Road Map within Central Asia Regional Economic Cooperation," ADB, (2016).

Appendix C: Donor Interventions in CWA

C.1 ADB's Energy Sector Interventions in the Region

1. ADB interventions to the energy sectors of each CWA country include Technical Assistance (TA), loans, and grants. Projects typically include construction and rehabilitation of generation facilities, transmission lines, substations, distribution networks, and metering, along with TAs for renewable energy and energy efficiency development, institutional and capacity development, and regional energy trade and cooperation.

2. Involvement in each energy sector varies based on country involvement and a balance of other priorities within the country. In Tajikistan, energy projects comprise 33 percent of ADB spending in the country (the highest of the region). In Kazakhstan, the energy sector only makes up.94 percent of spending, which still amounts to over USD 42 million since the beginning of ADB's involvement in the country. Appendix Table C.1 provides a summary of ADB's involvement in each country's energy sector, and the following subsections provide more detail about the types of energy sector projects that have been completed in each country.

Appendix Table C.1: Summary of ADB's Energy Sector Contributions in CWA

Country	Beginning Year of ADB Involvement	Number of Energy Loans, Grants, and TA Approvals	Total Amount Spent on Energy ($ millions)	Energy Spending as a Percent of Total Spending in Country
Armenia	2005	3	62.70	5.96%
Azerbaijan	1999	9	441.45	19.01%
Georgia	2007	3	124.20	6.45%
Kazakhstan	1994	6	42.32	0.94%
Kyrgyz Republic	1994	11	242.04	15.99%
Tajikistan	1998	19	451.55	32.86%
Turkmenistan*	2000	1	1.30	No Data
Uzbekistan	1995	22	1,541.20	29.55%

Source: ADB Country Fact Sheets, April 2016.

*Note: ADB has not had much involvement in Turkmenistan's energy sector as of 2016. ADB did have one USD 1.3 million TA for the Afghanistan and Turkmenistan Regional Power Interconnection, which closed in 2014.

C.1.1 Armenia

3. ADB and other IFIs involved in Armenia's energy sector have primarily focused on rehabilitation of the transmission network, adding renewable generation capacity

and improving regulatory and institutional frameworks.[148] Appendix Table A.1 summarizes ADB's energy sector contributions in Armenia.

Appendix Table C.2: Summary of ADB's Energy Sector Contributions in Armenia

Loans/Grants	Sevan–Hrazdan Cascade Hydropower System Rehabilitation Project (2013) Power Transmission Rehabilitation Project (2014)
Technical Assistance	TA grant for the preparation of a power transmission rehabilitation project (2012)

Source: ADB, "Projects in Armenia," (2016). http://www.adb.org/projects/armenia.

4. ADB's spending on Armenia's energy sector accounts for about 6 percent of its spending in the country since the beginning of its involvement in 2005. Compared to other countries in the region, ADB's involvement in Armenia's energy sector is relatively new, with the fist TA approved in 2012, for the preparation of a power transmission rehabilitation project. ADB also began the rehabilitation of the Sevan–Hrazdan Cascade Hydropower System in 2014. In the future, ADB plans to focus its involvement in Armenia's energy sector on rehabilitation of the transmission network, hydropower rehabilitation, improvements to cross-border interconnections, renewable energy development, and policy reforms for sustainability.[149]

C.1.2 Azerbaijan

5. ADB and other IFIs involved in Azerbaijan's energy sector have primarily focused on improvements in energy efficiency, increased renewable energy, and improved quality and reliability.[150] Appendix Table C.3 summarizes ADB's energy sector contributions in Azerbaijan.

Appendix Table C.3: Summary of ADB's Energy Sector Contributions in Azerbaijan

Loans/Grants	Power transmission enhancement project to build a double-circuit 220-kilovolt transmission line and associated substation facilities (2008) Shah Deniz Stage II gas field expansion project (construction of 26 subsea wells, two offshore platforms, gas and condensate subsea pipelines, expansion of the Sangachal terminal, two 900 mmscfd gas compressors, and connection to the South Caucasus Pipeline) (2015)
Technical Assistance	Renewable energy development TA (2005)

[148] As is described in the World Bank's *Country Partnership Strategy for the Republic of Armenia (FY2014-FY2017)*, the bank has worked to repair transmission networks, add renewable generation capacity, and build capacity for the financing of energy efficiency projects. EBRD's *Strategy for Armenia (2015)* notes accomplishments in improving the regulatory and institutional framework for sustainable energy.

[149] ADB, "Sector Assessment (Summary): Energy, Armenia," (2014).

[150] As is described in the World Bank's *Country Partnership Strategy for Azerbaijan (FY16-FY20)*, part of IFC's objectives is to reduce losses and optimize investments in state energy utilities. EBRD's *Strategy for Azerbaijan (2014)* describes a focus on energy security, new generating capacity, stimulating competition, diversify energy sources, improving energy efficiency, and regional integration. The strategy also describes the major achievement of the largest thermal power plant in Azerbaijan, AzDRES, becoming the first in the world to sell carbon credits in 2013, with the support of an EBRD loan for energy efficiency rehabilitation.

	Power transmission enhancement TA (2008) Power distribution development investment program (2009) Renewable energy development (Biomass cogeneration) project (2013) Preparing an enabling environment for private sector participation in the power sector (2014) Preparing MFF power distribution enhancement investment program (2015) Shah Deniz Stage II Investment Plan (2015)

Source: ADB, "Projects in Azerbaijan," (2016). http://www.adb.org/projects/azerbaijan.

6. ADB's spending on Azerbaijan's energy sector accounts for about 19 percent of its spending since the beginning of its involvement in the country in 1999 (although it did not become involved in the energy sector until 2006). In the area of construction, ADB had invested in power transmission enhancement in order to increase power reliability. TAs have focused on renewable energy as a way of improving quality of life in rural towns. Upcoming distribution improvements will improve the quality of power supplied to households and industries.[151] In the future, ADB plans to continue its work on renewable energy development, and will also focus on the rehabilitation of transmission and distribution networks, facilitation of regional power trade, reform of policies and institutions, and capacity development within the sector.[152]

C.1.3 Georgia

7. ADB and other IFIs involved in Georgia's energy sector have primarily focused on increased renewable energy generation, and regulatory and institutional reform.[153] Appendix Table C.4 summarizes ADB's energy sector contributions in Georgia.

Appendix Table C.4: Summary of ADB's Energy Sector Contributions in Georgia

Loans/Grants	Adjaristsqali Hydropower Project (185 MW run-of-the-river hydropower plant in South West Georgia) (2014)
Key Regional Projects	Regional power transmission enhancement project (2010)

Source: ADB, "Projects in Georgia," (2016). http://www.adb.org/projects/georgia.

151 ADB, "Member Fact Sheet: Azerbaijan", (2016).
152 ADB, "Sector Assessment (Summary): Energy, Azerbaijan," (2014).
153 As is described in the World Bank's *Country Partnership Strategy for Georgia (FY2014-FY2017)*, the bank focuses on reform of regulatory and institutional frameworks and support to renewable projects in the form of sector expertise, market assessments, product design, and financial structuring. IFC also seeks to facilitate interconnectivity with Turkey, through investments in transmission lines, mobilizing financing, preparing concessions, and the support of new hydropower. One of EBRD's focus areas in Georgia is the modernization of the energy sector, through increasing energy production and access to export markets. Upcoming projects will also focus on encouraging private sector participation through policy dialogue on market reforms and modern regulatory frameworks. Source: EBRD, "Georgia Overview," Accessed July 18, 2016. http://www.ebrd.com/where-we-are/georgia/overview.html.

8. ADB's spending on Georgia's energy sector accounts for about 6 percent of its spending since the beginning of its involvement in the country in 2007. Involvement has included three loans, grants, and TAs, which amount to USD 124.2 million. In 2014, ADB began the Adjaristsqali Hydropower Project, a 185 MW run-of-the-river hydropower plant in South West Georgia. Regionally, ADB provided a TA and USD 48 million loan to reinforce Georgia's energy grid and enhance regional power transmission between Georgia and other countries in the Caucasus region. In the future, ADB plans to support hydropower and energy efficiency projects, rehabilitation of transmission and distribution networks in rural and underdeveloped regions, promotion of regional trade, policy and institutional reforms, and knowledge sharing and capacity building in the sector.[154]

C.1.4 Kazakhstan

9. ADB and other IFIs involved in Kazakhstan's energy sector have primarily focused on extending access to energy, and increasing energy efficiency.[155] Appendix Table C.5 summarizes ADB's energy sector contributions in Kazakhstan.

Appendix Table C.5: Summary of ADB's Energy Sector Contributions in Kazakhstan

Loans/Grants	Akmola electricity distribution network modernization and expansion project (to increase reliable power supply to existing residential and commercial clients and increase connection to 35,000 additional households by 2020 in rural areas of Akmola province and Astana) (2013)
Technical Assistance	Karaganda district heating network rehabilitation project (2012)

Source: ADB, "Projects in Kazakhstan," (2016). http://www.adb.org/projects/kazakhstan.

10. ADB's spending on Kazakhstan's energy sector is the second lowest in the region (following Turkmenistan), and accounts for less than 1 percent of its spending in the country since the beginning of its involvement in 1994.[156] Kazakhstan has had less of a need for foreign borrowing due to high oil prices. However, ADB has been involved in modernizing the distribution network and rehabilitation of the district heating network. In the future, ADB plans to get more involved in the sector through energy efficiency, transmission, and new technology projects. [157]

C.1.5 Kyrgyz Republic

11. ADB and other IFIs involved in the Kyrgyz Republic's energy sector have primarily focused on rehabilitation of infrastructure, promoting regional integration, and improving financial viability of the sector.[158] Appendix Table C.6 summarizes ADB's energy sector contributions in the Kyrgyz Republic.

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[154] ADB, "Sector Assessment (Summary): Energy, Georgia," (2014).

[155] The World Bank's *Country Partnership Strategy for Kazakhstan (FY2012-FY2017)*, includes two outcomes for the energy sector: improving energy transmission to poor areas, and raising energy efficiency. EBRD has a priority in Kazakhstan to promote energy efficiency, and implement the Government's Green Economy Strategy partially through policy dialogue and financing of renewables projects. Source: EBRD, "Kazakhstan Overview," Accessed July 18, 2016. http://www.ebrd.com/where-we-are/kazakhstan/overview.html.

[156] ADB, "Member Fact Sheet: Kazakhstan", (2016).

[157] ADB, "Sector Assessment (Summary): Energy, Kazakhstan," (2012).

[158] One of the World Bank's development goals, outlined in the *Country Partnership Strategy for the Kyrgyz Republic (FY14-17)*, is to ensure energy security and develop export potential. The bank supports this goal through interventions to reduce distribution losses and improve commercial viability of energy utilities, and through knowledge building projects and regional trade projects.

Appendix Table C.6: Summary of ADB's Energy Sector Contributions in Kyrgyz Republic

Loans/Grants	Emergency rehabilitation (rehabilitation of 21km on four damaged power distribution lines in Chui and Osh impacted by landslides and floods) (2003) Power sector improvement project (introduction of automated metering and data acquisition system, upgrade of substation equipment, install a supervisory control system, and capacity building) (2010) Rehabilitation of the 1,200-megawatt Toktogul hydroelectric power plant (2012, and phase 2 2015)
Technical Assistance	Transmission and distribution metering project (2009) Enabling identification of PPP projects and capacity building (2011)

Source: ADB, "Projects in Kyrgyz Republic," (2016). http://www.adb.org/projects/kyrgyz-republic.

12. ADB's spending on the Kyrgyz Republic's energy sector accounts for about 16 percent of its spending in the country since the beginning of its involvement in 1994.[159] ADB's assistance for 2013-2017 focuses on improving supply and systems, improving sector financial performance, tariff reform, promoting regional power trade, and coordination with development partners on investments and provision of sector policies.[160] In the future, ADB will finance the rehabilitation of the Toktogul Hydroelectric Power Plant, which should greatly improve the sector's efficiency. ADB also plans to improve efficiency through a range of institutional and technical reforms.[161]

C.1.6 Tajikistan

13. ADB and other IFIs involved in Tajikistan’s energy sector have primarily focused on addressing winter power shortages through rehabilitation, new generation, and improved financial viability of the sector.[162] Appendix Table C.7 summarizes ADB’s energy sector contributions in Tajikistan.

EBRD’s *Strategy for the Kyrgyz Republic* (2015) describes a focus on strengthening regional integration to utilize energy export potential, promoting power sector sustainability through rehabilitation, and using institutional reform to attract private investments.

[159] ADB, "Member Fact Sheet: Kyrgyz Republic", (2016).

[160] ADB, "Country Partnership Strategy: Kyrgyz Republic, 2013-2017, Sector Assessment (Summary): Energy," (2013).

[161] ADB, "Member Fact Sheet: Kyrgyz Republic", (2016).

[162] The World Bank’s *Country Partnership Strategy for Tajikistan (FY15-18)* mentions improving energy reliability as one component of meeting the strategic goal of strengthening the role of the private sector. The strategy also stresses the need for improved governance and financial viability in order to reduce winter energy shortages and enable private sector growth. One of EBRD’s focus areas in the country is improving energy quality, regulation and energy efficiency, as a means of improving quality of life in Tajikistan. EBRD projects include infrastructure rehabilitation, institutional reform, and support for energy efficiency measures. Source: EBRD, “Tajikistan Overview,” Accessed July 18, 2016. http://www.ebrd.com/where-we-are/tajikistan/overview.html.

Appendix Table C.7: Summary of ADB's Energy Sector Contributions in Tajikistan

Loans/Grants	Increase generation capacity of the Golovnaya Hydropower Plant from 240MW to 252MW (2013) Wholesale metering and transmission reinforcement, involving the installation of 2,700 wholesale meters and billing system and 90 km of new 220kV transmission line interconnecting the Panjakent and Ayni regions (2014) Community-based rural power supply project, involving the rehabilitation of community-based energy organizations and implementation of up to six micro-hydropower pilot projects (serving 400 households each) (2004)
Key Regional Projects	Regional power transmission project, involving the construction of two new 220-kilovolt transmission lines and the rehabilitation of substations (2010)

Source: ADB, "Projects in Tajikistan," (2016). http://www.adb.org/projects/tajikistan.

14. ADB's spending on Tajikistan's energy sector accounts for about 33 percent of its spending in the country since the beginning of its involvement in 1998.[163] Major accomplishments in the sector include the upgrading of three hydropower plants, and the installation/upgrade of 571 kilometers of transmission and distribution lines. ADB has also co-financed projects such as the Strengthening Technical and Vocational Education and Training Program (under the Clean Energy Fund), and the Central Asia Regional Energy Cooperation (CAREC) Program which promotes regional energy trade, policy development, and rehabilitation of transport corridors.[164] ADB's strategy for the sector is to rehabilitate hydropower plants and transmission lines, construct new RE plants, promote PPPs, and facilitate institutional and tariff reforms.[165]

C.1.7 Turkmenistan

15. ADB and other IFIs have had limited involvement in Turkmenistan's energy sector and interventions have primarily focused on policy dialogue and regional projects.[166] Appendix Table C.8 summarizes ADB's energy sector contributions in Tajikistan.

Appendix Table C.8: Summary of ADB's Energy Sector Contributions in Turkmenistan

Key Regional Projects	Afghanistan and Turkmenistan: Regional Power Interconnection Project (2011)

[163] ADB, "Member Fact Sheet: Tajikistan", (2016).
[164] ADB, "Member Fact Sheet: Tajikistan", (2016).
[165] ADB, "Country Partnership Strategy: Tajikistan 2010-2014," (2010).
[166] The World Bank's *Turkmenistan Partnership Program Snapshot* (2016) indicates only limited advisory services in the energy sector, including an energy sector study in 1995, a study of export prospects in 2000, and a study on energy taxation in 2000, along with some regional projects. EBRD projects have also been limited in the sector due to insufficient reforms, but the Bank does provide policy dialogue support in order to promote these sector reforms. Source: EBRD, "Turkmenistan Overview," Accessed July 18, 2016. http://www.ebrd.com/where-we-are/turkmenistan/overview.html.

	Turkmenistan–Afghanistan–Pakistan–India natural gas pipeline (2010)

Source: ADB, "Projects in Turkmenistan," (2016). http://www.adb.org/projects/turkmenistan.

16. ADB has been involved in Turkmenistan since 2000, but has not yet had much involvement in the energy sector, aside from one USD 1.3 million TA to facilitate the long-term exporting of power to Afghanistan.[167] [168] This TA resulted in a power purchase and sales agreement which increased electricity exports from Turkmenistan to Afghanistan by five times the previous amount. An additional regional project is currently in progress, for a proposed 1,800km pipeline with the goal of exporting 33 bcm of natural gas per year from Turkmenistan to Afghanistan, Pakistan and India. ADB's Country Operations Business Plan 2016-2017 indicates plans for assistance in energy efficient power generation, cross-border power trade, and institutional and project management capacity building and governance, with resource allocation of $450 million in 2016-2018. [169]

C.1.8 Uzbekistan

17. ADB and other IFIs involved in Uzbekistan's energy sector have primarily focused on energy efficiency measures and improvements to reliability.[170] Appendix Table C.9 summarizes ADB's energy sector contributions in Uzbekistan.

[167] ADB, "Member Fact Sheet: Turkmenistan", (2015).
[168] ADB, "Country Operations Business Plan: Turkmenistan 2016-2017," (2015).
[169] ADB, "Country Operations Business Plan: Turkmenistan 2016-2017," (2015).
[170] The World Bank's *Country Partnership Strategy for Uzbekistan (FY12-FY15)* focuses on energy efficiency improvements in the sector, along with the continuation of regional interventions. As noted in EBRD's *Strategy for Uzbekistan* (2005), the Bank has increased generation capacity through financing of the Syrdariya Power Station, and has also contributed to policy dialogue on power sector reform, tariff structure, and corporate restructuring.

Appendix Table C.9: Summary of ADB's Energy Sector Contributions in Uzbekistan

Loans/Grants	Power generation efficiency improvement project, involving the construction of two units of 450 MW energy efficient combined cycle gas turbines at the Talimarjan Thermal Power Plant located in Kashkadarya region (2016) Northwest Region Power Transmission line (2015) Installation of advanced electricity metering (2011, 2015) Takhiatash power plant efficiency improvement project (2014) Samarkand 100 MW solar power project (2013) Namangan 500-Kilovolt power transmission project (2012) Talimarjan 800MW combined cycle gas turbine power plant (2010)
Technical Assistance	Solar energy development (2011) Design and strengthening of the Solar Energy Institute, comprised of qualified experts to promote, develop and transfer modern solar technology (2011)

Source: ADB, "Projects in Uzbekistan," (2016). http://www.adb.org/projects/uzbekistan.

18. ADB's spending on Uzbekistan's energy sector accounts for about 30 percent of its spending in the country since the beginning of its involvement in 1995.[171] ADB has helped to improve Uzbekistan's energy security and reliability through the Samarkand Solar Power Project (100 MW on-grid PV plant) and the Takhiatash Power Plant Efficiency Improvement Project (new 560 MW combined cycle gas turbines). [172] ADB's strategy for the sector is to support energy efficiency and renewable energy (with a focus on solar), metering modernization, and new generation and transmission capacity.[173]

[171] ADB, "Member Fact Sheet: Uzbekistan", (2016).
[172] ADB, "Member Fact Sheet: Uzbekistan", (2016).
[173] ADB, "Sector Assessment (Summary): Energy, Uzbekistan," (2012).

Appendix D: Interviews with ADB Staff

1. To supplement our understanding of the challenges faced in promoting good jobs and inclusive growth, we interviewed several ADB staff members who have experience with energy sector projects in the region. They provided us with insight on both processes and projects that have proven to be successful in promoting good jobs and inclusive growth, and those which can offer lessons learned. They also provided their experience on assessing good job and inclusive growth impacts. Appendix Table D.1 shows the details of each interview. Section D.1 contains the primer provided to each interviewee including background on the project and the type of information we were looking to gather through interviews. Section D.2 contains the interview questions.

Appendix Table D.1: Interviews

Interviewees	Date and Time of Interview (EST)
Yuki Inoue, Economist/Financial Specialist	November 2, 2016 10:00-11:00 PM
Levan Mtchedlishvili, Senior Energy Specialist	November 3, 2016 10:00-11:00 PM
Tianhua Luo, Senior Energy Specialist	November 7, 2016 9:00-9:25 PM
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D.1 Primer for the Interviews

2. We are currently working on a paper which examines the links between energy infrastructure interventions, good job creation, and the promotion of inclusive growth. From our research we have identified many theoretical links, but we also recognize that external conditions or the planning and implementation of a project can determine the success or failure of these impacts.

3. From existing literature on the topic, we have identified some recurring problems that can break the theoretical links between energy interventions and good jobs/inclusive growth. The first problem is that the jobs created are not necessarily "good" (i.e. stable, safe, and well-paid). Second, these jobs may not be inclusive (i.e. jobs are provided disproportionately to men and the non-poor or exclude domestic employment). Third, there may be unintended negative impacts for the poor or for job growth. These impacts can include a mismatch in new job skills with those of older technologies, tariffs that are not affordable for the poor, or a variety of other complications. Lastly, the extent of the impacts seems to be limited by enabling conditions within the project area (for example, access to financing, geographic location, the policy and business environment, etc.).

4. We are looking for anecdotes to help us create a clearer depiction of energy projects which successfully achieve good jobs and inclusive growth, and those which do not. We invite you to share your experience on these points, and lessons you have learned about improving the success of good job and inclusive growth impacts.

D.2 Interview Questions

5. Please share with us an example of an energy project that had a significant impact on good job creation.

   a. What were the job targets (if any)? How were they measured (if at all)?

i. If there were targets: Did these targets identify any required job characteristics (i.e. wage, percent allocation to women, etc.)

1. Were these targets met?

a. If yes, what were key factors that led to the success?

b. If no, why not? Was this a problem with the project design, implementation, or an external issue? Please explain.

ii. If there were no targets: Explain the good job impacts you have observed from this project.

1. What about the project design, implementation, and/or conditions in the project area effected job creation?

6. Please share with us an example of an energy project that did not have a significant impact on good job creation.

a. What were the job targets (if any)? How were they measured (if at all)?

i. If there were targets: Did these targets identify any required job characteristics (i.e. wage, percent allocation to women, etc.)

1. Were these targets met?

a. If yes, what were key factors that led to the success?

b. If no, why not? Was this a problem with the project design, implementation, or an external issue? Please explain.

ii. If there were no targets: Explain the shortfalls in good job impacts you have observed from this project.

1. What about the project design, implementation, and/or conditions in the project area effected job creation?

7. Please share with us some examples of projects that have had a significant impact on inclusive growth.

a. What were the inclusive growth targets associated with this project (if any)? How were they measured (if at all)?

i. If there were targets: Were each of these targets met?

1. If yes, what were key factors that led to the success?

2. If no, why not? Was this a problem with the project design, implementation, or an external issue? Please explain.

ii. If there were not targets: Explain the growth impacts you have observed from this project?

1. What about the project design, implementation, and/or conditions in the project area effected growth/inclusive growth?

8. Please share with us some examples of projects that have not had a significant impact on inclusive growth.

   a. What were the inclusive growth targets associated with this project (if any)? How were they measured (if at all)?

      i. If there were targets: Were each of these targets met?

         1. If yes, what were key factors that led to the success?

         2. If no, why not? Was this a problem with the project design, implementation, or an external issue? Please explain.

      ii. If there were not targets: Explain the shortfalls in growth impacts you have observed from this project?

         1. What about the project design, implementation, and/or conditions in the project area effected growth/inclusive growth?

9. Invariably energy projects are categorized as promoting "inclusive economic growth" and "job creation" as strategic agenda. From your own experience, to what extent are the energy projects designed to explain the linkage and causality, and why? Do you require the linkage/impact analysis in the feasibility study? Have you included relevant targets in DMF? How do you write the section 1 on poverty and social analysis and strategy?

10. Do you think it is reasonable to expect energy infrastructure projects to contribute to good jobs and inclusive growth? Should individual projects be held accountable for these goals?

11. If a manual or guiding principle technical note would be prepared, how can such a manual assist you in preparing DMF and IPSA/SPRSS?

12. Are there any suggestions you would make for project design or implementation, which would allow energy sector projects to better achieve good job creation and contribute to inclusive growth impacts?