

NAME OF STAFF Christopher Parcels

EMPLOYER DHInfrastructure

EDUCATION	<u>School, college and/or University Attended</u>	<u>Degree/certificate or other specialized education obtained</u>	<u>Date obtained</u>
	Villanova University	M.A. in History	2007
Providence College	B.A. in History and Psychology	2004	

OTHER TRAINING IPU Ratemaking Course, Institute of Public Utilities, Michigan State University

COUNTRIES OF WORK EXPERIENCE Albania, Angola, Armenia, Azerbaijan, Bangladesh, Belarus, Benin, Bosnia and Herzegovina, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, China Comoros, Congo, Democratic Republic of the Congo, Cote d'Ivoire, Ethiopia, Gabon, Gambia, Republic of Georgia, Ghana, Guinea, Kazakhstan, Kenya, Kosovo, Kyrgyzstan, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Montenegro, Mozambique, Namibia, Nauru, Niger, Nigeria, North Macedonia, Rwanda, Sao Tome and Principe, Senegal, Serbia, Seychelles, Sierra Leone, South Africa, Swaziland, Tajikistan, Tanzania, Timor-Leste, Togo, Uganda, Ukraine, Uzbekistan, Vanuatu, Zambia, Zimbabwe

EMPLOYMENT RECORD

- From:** Nov 2017 **To:** Current
Employer: DHInfrastructure
Position held: Manager
- From:** Nov 2016 **To:** Nov 2017
Employer: DHInfrastructure
Position held: Senior Analyst
- From:** May 2014 **To:** Nov 2016
Employer: DHInfrastructure
Position held: Analyst
- From:** Sep 2007 **To:** May 2013
Employer: University of Massachusetts, Amherst
Position held: Teaching Assistant
- From:** Jun 2009 **To:** Jul 2012
Employer: Summer Institute for the Gifted
Position held: Instructor
- From:** May 2004 **To:** Jul 2005
Employer: Blue Cross Blue Shield of Massachusetts
Position held: HR Operations Analyst

Project Experience

Name of project: Assessing the Performance of Power Sector Utilities in Sub-Saharan Africa

Year: 2019 to 2019

Location: Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Comoros, Congo, Congo, The Democratic Republic of the, Cote d'Ivoire, Ethiopia, Gabon, Gambia, Ghana, Guinea, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Nigeria, Rwanda, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, South Africa, Swaziland, Tanzania, Togo, Uganda, Zambia, Zimbabwe

Client: The World Bank

Main project features: The World Bank wanted to develop a framework for periodically measuring the operational, financial, commercial, and corporate performance of power sector utilities in Sub-Saharan Africa. The framework would guide the Bank's dialogue with governments and donors for improving utility performance.

Positions held: Project Manager

Activities performed: Chris identified key performance indicators (KPIs) for use in evaluating utilities on operational efficiency, investment planning and procurement, maintenance of existing infrastructure, cash management, cost recovery, financial position, transparency and accountability, service quality, and corporate governance. He developed data collection and database templates and validated utility data collected by other consultants. He calculated KPIs for each dimension of

utility performance. He identified risks faced by utilities and recommended risk mitigation procedures. He also recommended ways for utilities to improve their KPI scores for subsequent editions of the study.

Name of project: Institutional Reform of Uzbekistan's Power Sector

Year: 2018 to 2018

Location: Uzbekistan

Client: The World Bank

Main project features: The World Bank wanted to assist the Government of Uzbekistan in its initiative to restructure the country's power sector. The aims of the reform were to improve the power sector's performance, to transition toward a market-based approach, and to enhance sector efficiency and sustainability.

Positions held: Analyst

Activities performed: Chris reviewed the policy, legal and regulatory, institutional, and governance framework in the power sector. He also analyzed the underlying reasons for gaps between the power sectors of Uzbekistan and the other countries. He developed recommendations for reforming the power sector and put together a presentation outlining these recommendations for stakeholders.

Name of project: Water Tariff and Affordability Study in Arusha, Tanzania

Year: 2017 to 2018

Location: Tanzania

Client: Arusha Urban Water Supply and Sanitation Authority

Main project features: The Arusha Urban Water Supply and Sanitation Authority (AUWSA) wanted to conduct a tariff and willingness-to-pay study as part of an African Development Bank (AfDB) funded project to improve and expand the water and sanitation network in Arusha City. The two components of the project included a cost-of-service study and a willingness-to-pay study. For the of the cost-of-service study, AUWSA wanted a financial model that they could use for future tariff filings to the water sector regulator. They also wanted the model to allow them to forecast the impact of increased debt service on its financial performance and tariff levels. AUWSA wanted a willingness-to-pay study to understand how much they could charge for new water connections and septic tank vacuum truck services.

Positions held: Tariff Analyst

Activities performed: Chris reviewed historical data and developed demand projections to 2021. Using these data, he estimated the revenue requirement and conducted an allocated cost-of-service study to inform the tariff design recommendations.

Name of project: Updating a Financial model for a Potential Geothermal Site in Armenia

Year: 2017 to 2017

Location: Armenia

Client: Armenia Renewable Resource and Energy Efficiency

Main project features: The Armenia Renewable Resources and Energy Efficiency Fund (R2E2) wanted to update the 2012 economic and financial appraisal of a potential geothermal plant at Karkar, Armenia, based on the results of exploratory drilling at the site conducted in late 2016. The objective of the study was to analyze the economic and financial viability of a number of different conceptual plant scenarios based on the exploratory drilling and to attract private investment in geothermal opportunities at the Karkar site.

Positions held: Project Manager

Activities performed: Chris updated the economic and financial analysis of the conceptual geothermal plant scenarios (including a range of resource temperatures and well flow volumes) based on the results of the exploratory drilling at the Karkar site. Finally, he developed a brief investment prospectus to assist R2E2 and the Government of Armenia in attracting private investment for geothermal development at the Karkar site.

Name of project: Kosovo Update of Options Study Model

Year: 2017 to 2017

Location: Kosovo

Client: The World Bank

Main project features: The World Bank wanted to update the supply options study for Kosovo, originally completed in 2011 and updated in 2014, to account for more recent data related to assumptions. The World Bank wanted to update the

assumptions, conduct the required model runs and checks for accuracy, update the options study report to reflect the new results, and support the transfer of the model to World Bank team users. The objective of the study was to determine which new plant scenario would be least-cost for Kosovo.

Positions held: Project Manager

Activities performed: Chris updated assumptions provided by the World Bank and advised on additional assumptions. He modeled the economic hourly dispatch of each conventional and renewable plant in Kosovo's system from 2017 to 2052 in order to determine the least-cost scenario for a range of 10 new plant scenarios. He conducted sensitivity analyses and determined switching values for a wide range of variables, including demand growth, discount rate, fuel prices, capital expenditure, carbon prices, local environmental costs, import prices, and timelines for gasification of Kosovo.

Name of project: Sierra Leone Regulatory Strengthening and Tariff Development

Year: 2017 to 2018

Location: Sierra Leone

Client: Millennium Challenge Corporation Coordinating Unit (MCCU)

Main project features: The Millennium Challenge Corporation Unit (MCCU) in Sierra Leone wanted to support the Commissioners and technical staff of the Electricity and Water Regulatory Commission (EWRC) in developing the skills and knowledge necessary for EWRC to become an effective, independent, and transparent regulator for the electricity and water sectors. Specifically, MCCU wanted to develop a training program for EWRC's Board of Directors; develop a business plan for the regulator; develop key regulations and tariff methodologies for both sectors; provide substantial training and capacity building to EWRC staff; and provide ongoing advisory support through an embedded regulatory advisor. MCCU hired AARC, with DHInfrastructure as subcontractor, to implement the project.

Positions held: Manager

Activities performed: Chris researched international best practice, citing examples from regulators in Africa, in support of new regulations for licensing, technical (grid) codes, conduct of business rules, uniform system of accounts, customer service rules, quality of service regulations, and tariff guidelines. He also conducted a preliminary allocated cost of service study for the national electricity and water utilities to determine each company's revenue requirement and allocate it to each company's functions, classifications, and customer classes. He also supported the development of a power sector financial model. He contributed to the writing and editing of reports and presentations related to the assessment of the electricity and water regulatory frameworks, utility cost-of-service analysis, the power sector financial model and related training, and the dry-run rate cases.

Name of project: Preparation of SREP Investment Plan for Lesotho

Year: 2017 to 2017

Location: Lesotho

Client: The World Bank

Main project features: The Government of Lesotho requested assistance in the preparation of an Investment Plan (IP), which would be used to apply for renewable energy project funding through the Climate Investment Funds Scaling Up Renewable Energy Program (SREP). The primary objective of the IP was to identify renewable energy projects where SREP resources and other sources of funds could be used to overcome barriers to investment. These projects were identified by building upon existing analyses of renewable energy potential in Lesotho through in-depth resource and financing modeling. Project identification also involved working with a diverse set of national and international stakeholders from industry, academia and government.

Positions held: Analyst

Activities performed: Chris researched the legal, regulatory, and institutional framework of Lesotho's energy sector. He researched urban and rural households' use of fuel for heating, lighting, and cooking, as well as possible renewable energy business models. He researched and summarized the World Bank's energy access pilot projects in Lesotho. He helped assess Lesotho's debt absorption capacity. Finally, he helped write up the technical assessments of potential renewable energy technologies.

Name of project: Evaluation of IFC's Central Asia and South Caucasus Energy Infrastructure Program

Year: 2016 to 2016

Location: Armenia, Azerbaijan, Republic of Georgia, Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan

Client: International Finance Corporation (IFC)

Main project features: The International Finance Corporation (IFC) wanted a mid-term evaluation of their Central Asia and South Caucasus Energy Infrastructure Program, which promotes renewable energy development in the region through

supporting governments in improving the investment climate for renewable energy, and through direct support to the private sector. The objective of the evaluation was to assess the Program's progress toward its objectives and targets; to assess the impact of macroeconomic changes on the Program's implementation and evaluate the likelihood of the Program reaching its desired impacts; and to identify lessons learned and make recommendations to ensure success in the second half of the Program's implementation.

Positions held: Project Manager

Activities performed: Chris reviewed Program documents, collected and analyzed data on the macroeconomic conditions in each country in the region, and coordinated and conducted interviews in order to assess the Program's progress toward its objectives and its output, outcome, and impact targets. He identified lessons and developed recommendations to help ensure the Program would be as successful as possible in the second half of its implementation, and developed presentations for Program staff and for donors.

Name of project: Ukraine Cost of Gas Service and Financial Analysis

Year: 2016 to 2016

Location: Ukraine

Client: The World Bank

Main project features: The World Bank wanted to assess the financial standing of Ukraine's gas sector and major gas companies after tariff reforms in 2014 and 2015 and in advance of further planned increases in 2016-2017. The financial assessment resulted in recommendations for improving the sector's and companies' financial standing, including revisions to tariff-setting methodologies.

Positions held: Project Manager

Activities performed: As Project Manager, Chris coordinated the work of subcontractors and local consultants and integrated their inputs into final deliverables. He reviewed the institutional, contractual, and regulatory framework of Ukraine's gas sector; built a financial model to assess sector and company revenues and cash inflows based on tariff revisions in 2015 and 2016; and made recommendations for improving the financial standing of major gas companies. Chris also prepared a presentation and executive summary that included an overview, based on case studies of gas sector reform in Italy and Romania, of important milestones toward a fully competitive gas sector.

Name of project: Nauru Power and Water Tariff and Subsidy Reform

Year: 2015 to 2016

Location: Nauru

Client: Asian Development Bank (ADB)

Main project features: The Government of Nauru requested technical assistance (TA) from the Asian Development Bank (ADB) to reform electricity tariffs for its national utility provider, Nauru Utilities Corporation (NUC). This TA aimed to contribute to long-term sustainability and viability of NUC as an electric utility and to support proposed investments in NUC's generation facilities under ADB's Nauru Electricity Supply Security and Sustainability Project. The scope of the TA was subsequently expanded to include support for water tariff reforms. The objective of this additional TA was to make similar tariff-setting and subsidy recommendations for NUC's Water Service Division.

Positions held: Analyst

Activities performed: Chris assessed the fiscal and social impacts of potential subsidy schemes in the water sector and recommended a scheme that shielded customers from price shocks without increasing the fiscal impact to Government as compared to the existing subsidy scheme. Chris also integrated the separate electricity and water sector reports into one integrated report.

Name of project: Preparation of the Scaling-up Renewable Energy Program (SREP) Investment Plan in Bangladesh

Year: 2015 to 2015

Location: Bangladesh

Client: The World Bank

Main project features: The Government of Bangladesh requested assistance in the preparation of an Investment Plan (IP), which would be used to apply for renewable energy project funding through the Climate Investment Funds Scaling Up Renewable Energy Program (SREP). The primary objective of the IP was to identify renewable energy projects where SREP resources and other sources of funds could be used to overcome barriers to investment. These projects were identified by building upon existing analyses of renewable energy potential in Bangladesh through in-depth resource and financing modeling. Project identification also involved working with a diverse set of national and international stakeholders from industry, academia and government. In preparing the IP, we assessed the potential for developing the following renewable

resource options: wind power, solar PV, small hydropower, geothermal power, biomass and biogas, solar-based microgrids, solar home systems, and solar irrigation pumps.

Positions held: Analyst

Activities performed: Chris researched the challenges facing Bangladesh's energy sector, barriers to renewable energy development in Bangladesh, and the risks and benefits of each renewable energy technology under consideration. He reviewed the institutional, policy, and regulatory framework of the electricity sector. He drafted sections of the final Investment Plan related to these activities, and contributed to several stakeholder presentations, including the final presentation to the SREP Sub-Committee.

Name of project: Scaling Up Energy Efficiency Retrofit of Residential and Public Buildings

Year: 2015 to 2015

Location: Belarus

Client: The World Bank

Main project features: The World Bank requested a report for the Government of Belarus that would recommend financing and delivery options for scaling up energy efficiency investments in thermal retrofits and heating system upgrades in residential and public buildings. The assignment consisted of four parts: (1) a stocktaking of the legal, regulatory, and institutional environment and characteristics of the building sector, including management, ownership, and financing procedures; (2) an assessment of the potential for energy efficiency improvements and their associated investment needs; (3) an analysis of the barriers and potential solutions to investment; and (4) development of a road map and areas for donor involvement.

Positions held: Analyst

Activities performed: Chris built Excel models based on data collected by local consultants to determine the potential energy savings and related investment costs of various packages of energy efficiency measures for both the residential and public buildings sectors, and used the models to build supply curves for each package of measures for each type of building. He drafted the sections of the report describing the building stock and the analysis of energy savings and investment costs. He also drafted detailed methodologies for the energy savings and investment calculations to be included as annexes to the final report.

Name of project: Nauru Utility Reform

Year: 2015 to 2015

Location: Nauru

Client: Asian Development Bank (ADB)

Main project features: The Asian Development Bank (ADB) wanted to support the Government of Nauru in improving the financial, operational and governance performance of the Nauru Utilities Corporation (NUC). The assignment specifically supported: (1) the development of an asset management and maintenance plan; (2) the implementation of a new asset management system that supports the financial management information system; (3) the implementation of a performance management system for non-managerial NUC staff; and (4) a review of the corporate governance of the organization.

Positions held: Project Manager

Activities performed: Chris researched legislative and regulatory procedures in Nauru and international best practice for boards of directors. He edited the inputs of each project expert into final project deliverables.

Name of project: Ukraine Heating Tariff Reform

Year: 2014 to 2015

Location: Ukraine

Client: The World Bank

Main project features: The Government of Ukraine recently increased gas and heating tariffs. In order to protect the most vulnerable households, more comprehensive reform of social assistance programs is needed, especially since gas and heating prices will see further increases in the medium term to bring them to cost recovery levels. The World Bank has been tasked to help the government with these reforms, with the public information campaigns to explain the benefits of the reforms to the population, and with regulatory reform necessary to ensure that gas and heating tariffs remain reflective of the costs.

Positions held: Analyst

Activities performed: Chris helped develop presentations for the stakeholder workshops, researched and summarized international tariff reform case studies, and assisted in the preparation of a short paper outlining the recent reforms in

Name of project: Least Economic Cost Planning of New Supply in Georgia

Year: 2014 to 2015

Location: Republic of Georgia

Client: The World Bank

Main project features: The World Bank requested a least-cost power supply study for Georgia. The objective of the least-cost plan was to inform the Government of options for meeting future domestic and export power demand. The World Bank wanted several supply portfolios to be considered for the least-cost plan. The supply portfolios would take into account the existing hydropower potential in Georgia as well as other supply options such as CCGT, renewables, energy efficiency, and imports. The least-cost plan would be determined by ranking each supply portfolio according to Long-Run Average Incremental Costs (LRAIC) and net present values. The final report would then provide the Government with a better understanding of the generation supply requirements in the coming years, along with a least-cost plan for meeting these requirements and a tariff impact analysis.

Positions held: Analyst

Activities performed: Chris researched Georgia's regulatory framework to understand the country's tariff-setting methodologies and procedures, and contributed to a model for calculating a weighted average generation tariff. He also assisted in the preparation of presentations for key project stakeholders.

Name of project: Regional Energy Sector Diagnostic Report for the Western Balkans

Year: 2014 to 2015

Location: Albania, Bosnia and Herzegovina, North Macedonia, Montenegro, Serbia, Kosovo

Client: The World Bank

Main project features: The energy landscape in the Western Balkans has been in a complex and challenging state in the past three decades and no clear systematic picture of those challenges currently exists. The objective of this project was to develop a regional energy sector diagnostic report identifying energy issues and constraints which require country-specific and regionally-coordinated interventions in the Western Balkans.

Positions held: Analyst

Activities performed: Chris conducted research and analysis on the energy regulators in the each country. He also reviewed their institutional, policy, and regulatory frameworks in order to summarize each country's compliance with the Energy Community's Acquis on Electricity.

Name of project: Options for Power Sector Reform in Timor-Leste

Year: 2014 to 2014

Location: Timor-Leste

Client: Asian Development Bank (ADB)

Main project features: The Asian Development Bank (ADB) wanted to present to Government a series of reform options for Timor-Leste's power sector. This required: (1) the examination of the current policy, legal and regulatory framework in the country's power sector, including the contractual arrangements with the private sector; (2) an identification of options for unbundling the sector, introducing competition, and introducing additional public private partnerships; (3) consultation with stakeholders on their preferred option, and (4) recommendation of the option most suitable for Timor-Leste. Additionally, Timor-Leste's National Procurement Commission asked for support in creating a contract with the country's transmission and dispatch system operator. Current operations & maintenance (O&M) contracts for Timor-Leste's major diesel power plants (Hera, Betano, and Comoro); and O&M arrangements for the operation of the country's transmission and dispatch system are coming to an end.

Positions held: Analyst

Activities performed: Chris drafted a summary outlining the challenges facing the power sector, the role PPPs could play in solving those challenges, the key decisions to be made by Government, and the project team's recommendations related to each decision.

Name of project: Finalizing Heating Assessments for Tajikistan and the Kyrgyz Republic

Year: 2014 to 2015

Location: Kyrgyzstan, Tajikistan

Client: The World Bank

Main project features: The World Bank conducted a comprehensive heating assessment for the urban building sectors in the Kyrgyz Republic and Tajikistan to identify viable heating options and related energy efficiency measures to help meet heat demand in urban residential and public buildings.

Positions held: Analyst

Activities performed: Chris reviewed input reports provided by the international consultancy company and researched international best-practice case studies in support of recommendations for heating options for Tajikistan and the Kyrgyz Republic. He calculated the levelized cost of heat supply and cost efficiency factor of each potential option. Finally, Chris assisted the team in finalizing presentations of the report findings for World Bank management and key stakeholders.

Name of project: Evaluation of Public-Private Partnership Transaction Advisory Program in Europe and Central Asia

Year: 2014 to 2014

Location: Albania, Kazakhstan, Macedonia, The former Yugoslav Republic of, Kosovo

Client: International Finance Corporation (IFC)

Main project features: The International Finance Corporation's (IFC) transaction advisory services group needed a consulting firm to evaluate the operations of two donor-funded programs that it manages: the Southeast Europe Infrastructure Advisory (SEIA) and Europe and Central Asia Infrastructure Advisory (ECA IA). The main objective of this review was to provide lessons learned that would generate actionable recommendations for IFC and the donor governments on whether support for these programs should be continued past their expiry in 2015.

Positions held: Analyst

Activities performed: Chris conducted research into the issue of infrastructure under-development throughout the region, and developed summaries of public-private partnerships and current donor activity in the region.

Name of project: Scaling Up Renewable Energy (SREP) Investment Plan for Vanuatu

Year: 2014 to 2014

Location: Vanuatu

Client: Department of Energy, Ministry of Climate Change and Natural Disasters, Government of Vanuatu

Main project features: The Government of Vanuatu needed assistance with the preparation of a renewable energy Investment Plan, which would be used to apply for funding through the Climate Investment Funds' Scaling Up Renewable Energy Program (SREP).

Positions held: Analyst

Activities performed: Chris researched the Government's renewable energy strategy and the role of the private sector in renewable energy (both grid-connected and off-grid) in Vanuatu.

Name of project: Financial Analysis of Power Sector Utilities in the Western Balkans

Year: 2014 to 2016

Location: Albania, Bosnia and Herzegovina, North Macedonia, Montenegro, Serbia, Kosovo

Client: The World Bank

Main project features: Existing network and end-user power tariffs in the Western Balkans do not adequately reflect the cost of service provision, and thus cannot support new generation investments, either by attracting private investors or by providing domestic utilities with the means to invest on their own. For the purpose of assessing the financial viability of the power sector, the World Bank requested a comprehensive financial analysis of the power sector in five countries of the Western Balkans. Later, the World Bank requested an update to this analysis, to include current data, additional utilities, and add Albania to the analysis.

Positions held: Analyst

Activities performed: Chris reviewed the utilities' financial statements and extracted the data needed to update the model. He also formatted and organized the data to be incorporated into the updated model.

Name of project: Advice on Public-Private Partnership (PPP) Policy, Regulation and Transactions in China

Year: 2014 to 2015

Location: China

Client: Asian Development Bank (ADB)

Main project features: The Asian Development Bank (ADB) requested as-needed support to assist the People's Republic of

China in developing Public-Private Partnerships (PPPs). Specifically, ADB hired DHInfrastructure to support national-level government bodies in developing a PPP framework and local governments in structuring transactions.

Positions held: Analyst

Activities performed: Chris researched international best practice in Project Development Facilities (PDFs) for PPPs and the UK's Five Case Model for developing business cases. He then wrote a memo outlining how the Five Case Model could be adapted and integrated into China's PPP project cycle. Chris also wrote a memo outlining procedures for performing Value-for-Money analysis.
