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March 31, 2015

Jean D. Jewell, Secretary
Idaho Public Utilities Commission
Statehouse Mail
W. 472 Washington Street
Boise, Idaho 83720

RECEIVED
2015 MAR 31 AM 10:08
IDAHO PUBLIC
UTILITIES COMMISSION

AVU-E-13-00

RE: Avista Utilities Annual Report Regarding Selected Research and Development Efficiency Projects

Dear Ms. Jewell:

Enclosed for filing with the Commission is an original and 7 copies of Avista Corporation's dba Avista Utilities ("Avista or the Company") Report on the Company's selected electric energy efficiency research and development (R&D) projects, implemented by the state of Idaho's four-year Universities.

Please direct any questions regarding this report to Dan Johnson at (509) 495-2807 or myself at 509-495-4975.

Sincerely,

Linda Gervais
Manager, Regulatory Policy
Avista Utilities
509-495-4975
linda.gervais@avistacorp.com

Enclosure



AVISTA UTILITIES

SELECTED RESEARCH AND DEVELOPMENT EFFICENCY PROJECTS - Idaho

Annual Report

March 31, 2015

**ANNUAL REPORT
SELECTED RESEARCH AND DEVELOPMENT EFFICIENCY PROJECTS**

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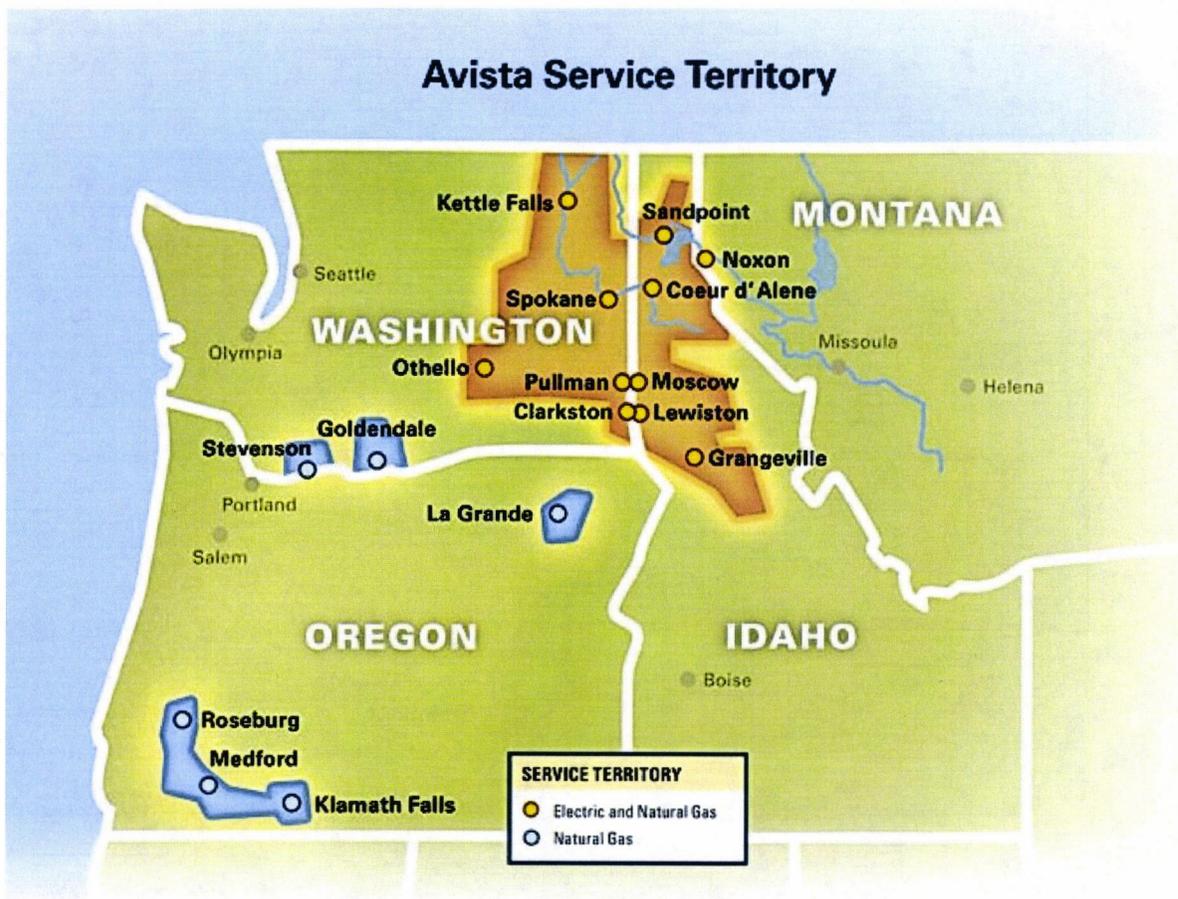
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I. SCOPE OF WORK

A. Introduction

This report is prepared in compliance with Idaho Public Utilities Commission (IPUC) Order No 32918. This includes key events during the reporting period and accounting for related expenditures.

Avista Corporation, doing business as Avista Utilities (hereinafter Avista or Company), at 1411 East Mission Avenue, Spokane, Washington, is an energy company involved in the production, transmission and distribution of energy as well as other energy-related businesses. Avista Utilities is the operating division that provides electric service to more than 700,000 electric and natural gas customers. Their service territory covers 30,000 square miles in eastern Washington, northern Idaho and parts of southern and eastern Oregon, with a population of 1.5 million.



On August 30, 2013 Avista applied for an Order authorizing the Company to accumulate and account for customer revenues that would provide funding for selected electric energy efficiency research and development (R&D) projects, proposed and implemented by the state of Idaho's four-year Universities. The Commission approved the funding in Order No. 32918 to fund up to \$300,000 per year of R&D from revenue collected through the Company's Schedule 91, "Energy Efficiency Rider Adjustment," effective November 1, 2013.

This program provides a stable base of research and development funding that allows research institutions to sustain quality research programs that benefit customers. It is also consistent with Idaho Governor Butch Otter's Idaho Global Entrepreneurial Mission "iGem" initiative in which industry would provide R&D funding to supplement funding provided by the State of Idaho.

II. KEY EVENTS

A. Request for Interest

The request for interest was prepared and distributed to all four Idaho Universities as shown below. A full copy of the request for Interest is included in **Appendix A**.

University	Point of Contact	Delivery Date
University of Idaho		
Boise State University		
Idaho State University		
College of Idaho		

Avista received 10 proposals from the University of Idaho and 6 proposals from Boise State University. The following is a list of the proposals the Company received:

University of Idaho

1. Bidirectional Charger Effects on Local Electrical Grid with Limited Access
2. Building Energy Signature as a Non-Intrusive Load Monitoring Tool
3. Determination of Best Distribution Voltage Levels to Minimize Loads and Power Losses
4. Energy Audits and Training for Wastewater Treatment Facilities
5. Enhanced Demand Response with Smart Building Energy Management Systems
6. Experimental Study of Motor Starters in Periodic Usage Environments to Quantify Energy Savings and Impact on Motor Life
7. Increasing Hydropower Generating Efficiency through Drag Reduction

8. Model Predictive Control for Radiant HVAC System
9. Simulation-Based Commissioning of Energy Management Control System
10. User Conservation

Boise State University

1. Citizen Survey
2. Commercial Building Analytis
3. Data Visulaization
4. Improving Accountability
5. Residential Static Var Compensator
6. Smart Thermostats

B. Selection of Projects

Avista prepared an evaluation matrix for the 16 proposed projects. A team of individuals representing Distribution, Transmission Planning, Generation and Demand Side Management, co-filled out the matrix to rank each of the projects. The following factors were considered in the ranking process.

- Research Areas Already Being Done (EPRI, WSU, AVA)
Complement/Redundant/New
- Potential Value to Customers kwh/KW/\$ (1-10)
- CO2 Emission Reduction (Y/N)
- Market Potential (1-10)
- Should be Considered for Future Submittal (Y/N)
- Our Results Measurable (Y/N)
- Aligned with Avista Business Functions (Y/N)
- New or Novel (Y/N)
- Ranking (1 -10)

The team from Avista was comprised of the following individuals:

- Dan Johnson – Energy Efficiency Senior Manager
- John Gibson – Distribution System Operations Manager
- Tom Lienhard – Energy Solutions Engineer Supervisor
- Reuben Arts – Project Engineer All Projects
- Erik Lee – Project Engineer Bidirectional Charger
- Ryan Bean – Project Engineer Increasing Hydropower Efficiency
- Levi Westra & Bryce Eschenbacher – Project Engineers Simulation Based Commissioning of Energy Management Systems

C. Description of Selected Projects

The following is a brief description of each of the four selected projects. Additional details are provided in the interim project reports and included in Appendix D, Appendix E, Appendix F, and Appendix G.

Increasing Hydropower Generating Efficiency through Drag Reduction: Energy loss due to friction occurs at various phases of hydropower generation. This research investigates the potential of reducing the energy loss in the penstock so that more energy is available for power generation. The concrete/cement surface of penstock inner walls is hydrophilic. Nanotechnology has made it possible to make these surfaces hydrophobic or even super-hydrophobic. Frictional drag reduction by hydrophobicity over concrete surface treated with Zycosil has not been demonstrated or quantified. This project evaluates the potential of frictional drag reduction over Zycosil-treated surfaces.

Bidirectional Charger Effects on Local Electrical Grids with Limited Access: With the increasing popularity of electrical vehicles and the anticipated decrease in their purchase prices over the next several years, electrical vehicles are coming to every commercial and academic campus. On-site charging is a benefit that many employers may want to provide. This project proposes to build a bidirectional charging system on a university campus, a system that operates within the voltages and power levels typical of a home or small commercial building. We will use this charger to investigate the effects of bidirectional charging on the electrical utility system within the building and on nearby buildings. From the data collected, we will identify the appropriate issues, from which we will prepare a larger proposal near the end of this project's term for a follow-on campus-wide investigation.

Simulation-Based Commissioning of Energy Management Control Systems: The research aims to develop a method to use energy simulation and co-simulation software to perform automated and semi-automated pre-commissioning or retro-commissioning (Cx) of the programming that resides inside a constructed building's energy management control system (EMS). This phase of the research is to complete manual proof of concept work, benchmark baseline performance of chosen test site, and estimate energy savings potential via simulation of alternate building control strategies.

Residential Static VAR Compensator: To develop a smart demand-side management device based on the concept of a Residential Static VAR Compensator (RSVC) for regulating residential voltages, especially during peak demand hours. The proposed residential static VAR compensator reduces power consumption during peak hours in order to save energy and costs of generation.

D. Project Manager and Related Communications

Avista set out to find an independent third-party project manager based in Idaho. On September 26, 2014, Avista entered into an agreement with T-O Engineers as its independent third party project manager. T-O Engineers is based in Boise, Idaho with additional offices in Coeur d'Alene, and Nampa.

T-O is tasked with providing project management, organizational structure, milestone setup, milestone tracking, and incidental administrative services. The project manager for T-O Engineers is JR Norvell, PE. JR is based out of the Coeur d'Alene office.

E. Agreements

On June 6, 2014 Avista entered into a master agreement with the University of Idaho. Key elements of this agreement include Confidential Information (section 5.8), Publication Rights (section 5.9), and Intellectual Property (section 5.16). The full agreement is included as **Appendix B**. Individual task orders are assigned for each of the research projects selected.

On October 21, 2014 Avista entered into an agreement with Boise State University. Key elements of this agreement include Confidential Information (section 5.8), Publication Rights (section 5.9), and Intellectual Property (section 5.16). The full agreement is included as **Appendix C**.

F. Project Milestones

The following Table No. 1 identifies each projects specific tasks as well as the overall research and development schedule and milestones. It is expected that a final report will be delivered from each Principle Investigator at the end of the summer semester. In addition to the written report, each research team will present their findings to Avista.

Table No. 1

Task Description	Sep-14	Oct-14	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Jul-15	Aug-15
	Fall Semester				Spring Semester				Summer Semester			
Basic Project Elements - All Projects												
1.0 Project Management	[Black arrow spanning Sep-14 to Aug-15]											
2.0 Develop Follow-on Proposal					[Black arrow spanning Jan-15 to Feb-15]							
3.0 Prepare Final Report									[Black arrow spanning May-15 to Aug-15]			
Bidirectional Charger Effects on Limited Access Grid												
1. Develop Test Plans and Install Equipment	[Green arrow spanning Sep-14 to Dec-14]											
2. Test Bidirectional Charging with PHEV					[Green arrow spanning Jan-15 to Apr-15]							
3. Test Low Power Bidirectional Charging					[Green arrow spanning Jan-15 to Apr-15]							
4. Document Results									[Green arrow spanning May-15 to Aug-15]			
Hydropower Generation Efficiency												
1. Prepare Test Instruments	[Orange arrow spanning Sep-14 to Oct-14]				[Orange arrow spanning Jan-15 to Feb-15]							
2. Conduct Tests on Sand Paper			[Orange arrow spanning Nov-14 to Dec-14]									
3. Conduct Tests on Concrete							[Orange arrow spanning Mar-15 to Apr-15]					
4. Efficiency Gain Evaluation and Additional Testing									[Orange arrow spanning May-15 to Aug-15]			
Energy Management Control Systems												
1. Energy Modeling	[Blue arrow spanning Sep-14 to Dec-14]											
2. BCVTB Modeling					[Blue arrow spanning Jan-15 to Apr-15]							
3. Run, Analyze and Reiterate								[Blue arrow spanning Apr-15 to Jul-15]				
4. Benchmark Performance					[Blue arrow spanning Jan-15 to Aug-15]							
Project Meetings - All Projects												
1. Project Kickoff	[Blue square]											
2. Monthly Project Updates		[Blue square]	[Blue square]	[Blue square]	[Blue square]	[Blue square]	[Blue square]	[Blue square]	[Blue square]	[Blue square]	[Blue square]	
3. Project Presentation to Avista							[Blue square]					[Blue square]
Milestones/Deliverables - All Projects												
1. Project Kickoff Meeting	[Red circle]											
2. Follow-on Proposal to Avista							[Red circle]					
3. Final Report to Avista												[Red circle]
4. IPUC Deliverables								[Red circle]	[Red dashed arrow spanning May-15 to Aug-15]			[Red circle]

G. For other than first-year projects, summary of research in-progress and anticipated completion milestones pursuant to contractual agreements and project manager's administration.

All projects are first year projects, thus a detailed summary of research is not yet available. This said, all projects are making good progress on their respective research topic.

H. Other relevant activity.

Project kick-off meetings were held on-site at the University of Idaho and Boise State University.

Each month a progress meeting is held for each project. These meetings typically take 1 to 1.5 hours and include a review of schedule, monthly progress reporting, invoicing, owner comments, and action items for the next month. The meetings are organized and led by the Independent Program Manager, T-O Engineers. Attendees for each meeting include the Principal Investigator, Co-Investigators, Student Researchers, Avista personnel, and the Independent Program Manager.

III. ACCOUNTING

A. Funds authorized for R&D projects

Contracts currently held are as follows:

Agency	Description	Amount	Point of Contact
University of Idaho*	Simulation-Based Commissioning of Energy Management Control System*	\$ 50,847.00 *	Dr. Kevin Van Den Wymelenberg*
University of Idaho	Bidirectional Charger Effects on Local Electrical Grid with Limited Access	\$ 78,697.00	Dr. Herbert L. Hess
University of Idaho	Increasing Hydropower Generating Efficiency through Drag Reduction	\$ 72,539.00	Dr. Jim C. P. Liou
Boise State University	Residential Static Var Compensator	\$ 60,000.00	Dr. Said Ahmed-Zaid
T-O Engineers	Project Manager	\$ 30,000.00	James R. Norvell
Total		\$ 292,083.00	

**Note that we are currently in negotiations to amend the maximum contract amount for the Simulation-Based Commissioning of Energy Management Control Systems project. It is anticipated that the original amount awarded will be modified by \$-4,142 from \$50,847 to \$46,705.*

B. Funds Expended and Remaining Balance

The following is a budget summary as of March 15, 2015. Final invoices for all projects listed in this annual report are anticipated in September of 2015.

Description	Budget Amount	Expended to Date	Budget Remaining
Simulation-Based Commissioning of Energy Management Control System**	\$ 50,847.00	\$ 12,736.42	\$ 38,110.58
Bidirectional Charger Effects on Local Electrical Grid with Limited Access	\$ 78,697.00	\$ 6,568.13	\$ 72,128.87
Increasing Hydropower Generating Efficiency through Drag Reduction	\$ 72,539.00	\$ 4,229.28	\$ 68,309.72
Residential Static Var Compensator	\$ 60,000.00	\$ 4,400.98	\$ 55,599.02
Project Manager	\$ 30,000.00	\$ 16,716.00	\$ 13,284.00
Direct Expenses	\$ 7,917.00	\$ 239.17	\$ 7,677.83
Totals	\$300,000.00	\$44,889.98	\$255,110.02

C. Cost-Recovery

Costs associated with R&D are funded from revenue collected through Avista's Schedule 91 – Energy Efficiency Rider Adjustment. This amount is a ceiling and not a requirement to allocate this funding in any given year. Any remaining balance (not ear-marked) will be rolled over to a future year, and if terminated, the unallocated portion will be added back to the tariff rider balance. The costs would be included in the Company's annual tariff filing in June if the rider balance requires a true-up.

APPENDIX A REQUEST FOR INTEREST

Request for Proposal (RFP)

Contract No. R-39605

for

Avista Energy Research (AER) Initiative

INSTRUCTIONS AND REQUIREMENTS

Proposals are due by:

4:00 p.m. Pacific Prevailing Time (PPT), January 31, 2014 (the "Due Date")

Avista Corporation is an energy company involved in the production, transmission and distribution of energy as well as other energy-related businesses. Avista Utilities is the operating division that provides electric service to approximately 362,000 customers and natural gas to approximately 323,000 customers. Avista's service territory covers 30,000 square miles in eastern Washington, northern Idaho and parts of southern and eastern Oregon, with a population of 1.5 million. Avista's primary, non-regulated subsidiary is Ecova. Avista's stock is traded under the ticker symbol "AVA". For more information about Avista, visit www.avistautilities.com.

**Avista Corporation ("Avista")
RFP Confidentiality Notice**

This Request for Proposal ("RFP") may contain information that is marked as confidential and proprietary to Avista ("Confidential Information" or "Information"). Under no circumstances may the potential Bidder receiving this RFP use the Confidential Information for any purpose other than to evaluate the requirements of this RFP and prepare a responsive proposal ("Proposal"). Further, Bidder must limit distribution of the Information to only those people involved in preparing Bidder's Proposal.

If Bidder determines that they do not wish to submit a Proposal, Bidder must provide a letter to Avista certifying that they have destroyed the Confidential Information, or return such Information to Avista and certify in writing that they have not retained any copies or made any unauthorized use or disclosure of such information.

If Bidder submits a Proposal, a copy of the RFP documents may be retained until Bidder has received notice of Avista's decision regarding this RFP. If Bidder has not been selected by Avista, Bidder must either return the Information or destroy such Information and provide a letter to Avista certifying such destruction.

Avista and Bidder will employ the same degree of care with each other's Confidential Information as they use to protect their own Information and inform their employees of such confidentiality obligations.

Instructions and Requirements

1.0 PURPOSE

in response to the Idaho Public Utilities Commission Order No. 32918, Avista Corporation will fund up to \$300,000 per year of applied research that will further promote broad conservation goals of energy efficiency and curtailment. Specifically, Avista is seeking a qualified four year institution in the state of Idaho to provide such applied research (the "Services"). In light of the rapidly changing utility landscape, Avista would be interested in funding research projects which are forward thinking and would assist the utility in the development of product and services which provide an energy efficient commodity to its customers. The applied research and development projects can be one or multiple years and can be used to support university research programs, facility and studies.

The following institutions are eligible to submit Avista Energy Research (AER) initiative proposals.

1. University of Idaho
2. Boise State University
3. Idaho State University

Persons or institutions submitting a Proposal will be referred to as "Bidder" in this RFP; after execution of a contract, the Bidder to whom a contract is awarded, if any, will be the name of the university ("Institution").

2.0 STATEMENT OF WORK

The attached Statement of Work ("SOW") specifies the activities, deliverables and/or services sought by Avista. This SOW will be the primary basis for the final SOW to be included under a formal contract, if a contract is awarded.

3.0 RFP DOCUMENTS

Attached are the following RFP Documents:

- Statement of Work
- Appendix A – Proposal Cover Sheet
- Appendix B – Sponsored Research and Development Project Agreement

4.0 CONTACTS / SUBMITTALS / SCHEDULE

- 4.1** All communications with Avista, including questions (see Section 5.1), regarding this RFP must be directed to Avista's Sole Point of Contact ("SPC"):

Russ Feist
Avista Corporation
1411 East Mission Avenue
PO Box 3727, MSC-33
Spokane, WA 99220-3727
Telephone: (509) 495-4567
Fax: (509) 495-8033
E-Mail: russ.feist@avistacorp.com

- 4.2** Proposals must be received no later than 4:00 PM Pacific Prevailing Time ("PPT"), on January 31, 2014 ("Due Date"). Bidders should submit an electronic copy of their Proposal to bids@avistacorp.com. In addition to an electronic copy, Bidders may also fax their Proposal to 509-495-8033, or submit a hard copy to the following address:

Avista Corporation
Attn: Greg Yedinak Supply Chain Management (MSC 33)
1411 E. Mission Ave
PO Box 3727
Spokane, WA 99220-3727

No verbal or telephone Proposals will be considered and Proposals received after the Due Date may not be evaluated.

4.3 RFP Proposed Project Schedule

<u>December 13, 2013</u>	Avista issues RFP
<u>January 6, 2014</u>	Bidder's Questions/Requests for Clarification Due
<u>January 13, 2014</u>	Avista's Responses to Clarifications Due Date
<u>January 31, 2014</u>	Proposals Due
<u>February 14, 2014</u>	Successful Bidder selection and announcement
<u>February 28, 2014</u>	Contract Executed

5.0 RFP PROCESS

5.1 Pre-proposal Questions Relating to this RFP

Questions about the RFP documents (including without limitation, specifications, contract terms or the RFP process) must be submitted to the SPC (see Section 4.1), in writing (e-mailed, faxed, or addressed in accordance with Section 4.2, by the Due Date. Notification of any substantive clarifications provided in response to questions will be provided via email to all Bidders.

5.2 Requests for Exceptions

Bidder must comply with all of the requirements set forth in the documents provided by Avista as part of this RFP (including all submittals, contract documents, exhibits or attachments). Any exceptions to these requirements must be: (i) stated separately, (ii) clearly identify the exceptions (including the document name and section), and (iii) include any proposed alternate language, etc. Failure by Bidder to provide any exceptions in its Proposal will constitute full acceptance of all documents provided by Avista as part of this RFP. While Avista will not consider alternate language, etc. that materially conflicts with the intent of this RFP, Avista may consider and negotiate the inclusion of terms that would be supplemental to the specific document if such terms reasonably relate to the scope of this RFP.

5.3 Modification and/or Withdrawal of Proposal

5.3.1 By Bidder: Bidder may withdraw its Proposal at any time. Bidder may modify a submitted Proposal by written request provided that such request is received by Avista prior to the Due Date. Following withdrawal or modification of its Proposal, Bidder may submit a new Proposal provided that such new Proposal is received by Avista prior to the Due Date and includes a statement that Bidder's new Proposal amends and supersedes the prior Proposal.

5.3.2 By Avista: Avista may modify any of the RFP documents at any time prior to the Due Date. Such modifications will be issued simultaneously to all participating Bidders.

5.4 Proposal Processing

5.4.1 Confidentiality: It is Avista's policy to maintain the confidentiality of all Proposals received in response to an RFP and the basis for the selection of a Bidder to negotiate a definitive agreement.

5.4.2 Basis of Any Award: This RFP is not an offer to enter into an agreement with any party. The contract, if awarded, will be awarded on the basis of Proposals received after consideration of Bidder's ability to provide the services/work, quality of personnel, extent and quality of relevant experience, price and/or any other factors deemed pertinent by Avista, including Bidder's ability to meet any schedules specified in the Statement of Work.

5.4.3 Pre-award Expenses: All expenses incurred by Bidder to prepare its Proposal and participate in any required pre-bid and/or pre-award meetings, visits and/or interviews will be Bidder's responsibility.

5.4.4 Proposal Acceptance Term: Bidder acknowledges that its Proposal will remain valid for a period of 60 days following the Due Date unless otherwise extended by Avista.

5.5 Contract Execution

The successful Bidder must enter into a contract that is substantially the same as the Sponsored Research and Development Project Agreement governing the performance of the Services/Work applicable under this RFP included as Appendix B.

6.0 PROPOSAL REQUIREMENTS AND SUBMITTALS

Bidder's Proposal must conform to the following outline and address all of the specified content to facilitate Avista's evaluation of Bidder's qualifications; approach to performing the requested Services/Work; and other requirements in the SOW. Proposals will be evaluated on overall quality of content and responsiveness to the purpose and specifications of this RFP, including the information set forth in Section 6.5 below.

6.1 Proposal Process

Each eligible institution will be limited to **TEN** specific proposal submittals. One representative of the eligible institutions will be responsible for submitting all of the proposals.

The proposal must **not exceed 6 pages** not including the appendices. The proposal shall be in 11 point font, 1.5 spaced and one inch margins. The original and one electronic copy of the proposal (PDF – Form) must be provided to Avista's point of contact listed herein.

6.2 Proposal Submittals The following items are required with Bidder's Proposal. Each proposal shall contain the following project elements.

1. Name of Idaho public institution;
2. Name of principal investigator directing the project;
3. Project objective and total amount requested (A general narrative summarizing the approach to be utilized to provide the required services);
4. Resource commitments, (number of individuals and possible hours for services);
5. Specific project plan (An outline of work procedures, technical comments, clarifications and any additional information deemed necessary to perform the services);
6. Potential market path;
7. Criteria for measuring success;
8. Budget Price Sheet / Rate Schedule;
9. Proposal Exceptions to this RFP (if any);
10. Appendix A – Proposal Cover Sheet (last 2 pages of this document)
11. Appendix C: Facilities and Equipment
12. Appendix D: Biographical Sketches and Experience of the principle investigators and / or primary research personnel for each project (if different individuals for each project submitted)

6.3 Proposal Cover Sheet

Bidder must fill out, sign and date the attached Proposal Cover Sheet. The signatory must be a person authorized to legally bind Bidder's company to a contractual relationship (e.g. an officer of the company).

6.4 Institution Information

- Institution Qualifications

Bidder shall provide information on projects of similar size and scope that Bidder has undertaken and completed within the last five years. Please include a list of references on Appendix A that could be contacted to discuss Bidders involvement in these projects.

Institution Resources

Identify any unique or special equipment, intellect, hardware, and software or personnel resources relevant to the proposed Services that Bidder's firm possesses(list in Appendix D).

- Project Personnel Qualifications

Provide a proposed organization chart or staffing list for a project of this size and scope and identify the personnel who will fill these positions. If applicable, identify project managers who will be overseeing the Services and submit their resume identifying their work history, (please see Section 6.2, question #4).

- Approach to Subcontracting

If Bidder's approach to performing the Services will require the use of subcontractors, include for each subcontractor: (a) a description of their areas of responsibility, (b) identification of the assigned subcontractor personnel, (c) resumes of key subcontractor personnel, (d) a summary of the experience and qualifications of the proposed subcontracting firms in work similar to that proposed, and (e) a list of references for such work.

6.5 Evaluation Criteria

Avista will evaluate each proposal based upon the following criteria:

6.5.1 Project Requirements

- Strength of Proposal
- Responsiveness to the RFP
- Creativity in Leveraging Resources
- Samples of Work Products
- Overall Proposal (Complete, Clear, Professional)

6.5.2 Strength & Cohesiveness of the Project Team

- Overall ability to manage the project
- Technical ability to execute the Services
- Research/analysis ability
- Project milestones with clear stage and gates (annually)
- Overall team cohesiveness

6.5.3 Qualifications and Experience

- Experience working with electric utilities
- Project management and multi-disciplined approaches
- Experience working with organizations in a team atmosphere

7.0 RESERVATION OF AVISTA RIGHTS:

Avista may, in its sole discretion, exercise one or more of the following rights and options with respect to this RFP:

- Modify, extend, or cancel this RFP at any time to obtain additional proposals or for any other reason Avista determines to be in its best interest;
- Issue a new RFP with terms and conditions that are the same, similar or substantially different as those set forth in this or a previous RFP in order to obtain additional proposals or for any other reason Avista determines to be in its best interest;
- Waive any defect or deficiency in any proposal, if in Avista's sole judgment, the defect or deficiency is not material in response to this RFP;
- Evaluate and reject proposals at any time, for any reason including without limitation, whether or not Bidder's proposal contains Requested Exceptions to Contract Terms;
- Negotiate with one or more Bidders regarding price, or any other term of Bidders' proposals, and such other contractual terms as Avista may require, at any time prior to execution of a final contract, whether or not a notice of intent to contract has been issued to any Bidder and without reissuing this RFP;
- Discontinue negotiations with any Bidder at any time prior to execution of a final contract, whether or not a notice of intent to contract has been issued to Bidder, and to enter into negotiations with any other Bidder, if Avista, in its sole discretion, determines it is in Avista's best interest to do so;
- Rescind, at any time prior to the execution of a final contract, any notice of intent to contract issued to Bidder.

[END OF REQUEST FOR PROPOSAL INSTRUCTIONS AND REQUIREMENTS]



APPENDIX A - Proposal Cover Sheet

Bidder Information

Organization Name: _____

Organization Form: _____
 (sole proprietorship, partnership, Limited Liability Company, Corporation, etc.)

Primary Contact Person: _____ Title: _____

Address: _____

City, State, Zip: _____

Telephone: _____ Fax: _____ Federal Tax ID# _____

E-mail Address: _____

Name and title of the person(s) authorized to represent Bidder in any negotiations and sign any contract that may result ("Authorized Representative"):

Name: _____ Title: _____

If classified as a contractor, provide contractor registration/license number applicable to the state in which Services are to be performed. _____

Provide at least three references with telephone numbers (please verify numbers) that Avista may contact to verify the quality of Bidder's previous work in the proposed area of Work.

REFERENCE No. 1: Organization Name: _____	Telephone: _____
Contact Person: _____	Fax: _____
Project Title: _____	Email: _____
REFERENCE No. 2: Organization Name: _____	Telephone: _____
Contact Person: _____	Fax: _____
Project Title: _____	Email: _____
REFERENCE No. 3: Organization Name: _____	Telephone: _____
Contact Person: _____	Fax: _____
Project Title: _____	Email: _____

By signing this page and submitting a Proposal, the Authorized Representative certifies that the following statements are true:

1. They are authorized to bind Bidder's organization.
2. No attempt has been made or will be made by Bidder to induce any other person or organization to submit or not submit a Proposal.
3. Bidder does not discriminate in its employment practices with regard to race, creed, age, religious affiliation, sex, disability, sexual orientation or national origin.
4. Bidder has not discriminated and will not discriminate against any minority, women or emerging small business enterprise in obtaining any subcontracts, if required.
5. Bidder will enter into a contract with Avista and understands that the final Agreement and General Conditions applicable to the Scope of Work under this RFP will be sent for signature under separate cover.
6. The statements contained in this Proposal are true and complete to the best of the Authorized Representative's knowledge.
7. If awarded a contract under this RFP, Bidder:
 - (i) Accepts the obligation to comply with all applicable state and federal requirements, policies, standards and regulations including appropriate invoicing of state and local sales/use taxes (if any) as separate line items;
 - (ii) Acknowledges its responsibility for transmittal of such sales tax payments to the taxing authority;
 - (iii) Agrees to provide at least the minimum liability insurance coverage specified in Avista's attached sample Agreement, if awarded a contract under this RFP.
8. If there are any exceptions to Avista's RFP requirements or the conditions set forth in any of the RFP documents, such exceptions have been described in detail in Bidder's Proposal.
9. Bidder has read the "Confidentiality Notice" set forth on the second page of these "INSTRUCTIONS AND REQUIREMENTS" and agrees to be bound by the terms of same.

Signature: _____ Date: _____

*** THIS PAGE MUST BE THE TOP PAGE OF BIDDER'S PROPOSAL ***

APPENDIX B UNIVERSITY OF IDAHO AGREEMENT

SPONSORED RESEARCH AND DEVELOPMENT PROJECT AGREEMENT

I. PARTIES

- 1.1 THIS AGREEMENT is made and entered into by and between The Regents of the UNIVERSITY of Idaho (UNIVERSITY), a public corporation, state educational institution, and a body politic and corporate organized and existing under the Constitution and laws of the state of Idaho, and Avista Corporation, a Washington corporation (SPONSOR). In this Agreement, the above entities are sometimes referred to as a PARTY and jointly referred to as PARTIES.

II. PURPOSE

- 2.1 This agreement provides the terms and conditions for an Avista-sponsored energy efficiency applied research and development project which is of mutual interest and benefit to UNIVERSITY and SPONSOR, and which has been approved by the Idaho Public Utilities Commission under Order 32918.
- 2.2 The performance of such sponsored research and development project is consistent with UNIVERSITY's status as a non-profit, tax-exempt, educational institution, and may derive benefits for SPONSOR, UNIVERSITY, and society by the advancement of knowledge in the field of study identified. The performance of such sponsored research and development projects may also derive benefits for SPONSOR through the development of energy efficiency products and/or services that could be offered to Avista customers in Idaho and other jurisdictions and/or licensed or sold to other utilities or their customers by Avista.
- 2.3 UNIVERSITY's capabilities reflect a substantial public investment, which UNIVERSITY, as a part of its mission as a state higher education institution, wishes to utilize in a cooperative and collaborative effort with SPONSOR, including substantial financial investment in sponsored research and development projects, as described below.

III. DEFINITIONS

- 3.1 "Budget" shall mean the Project Budget contained in *Attachment A-Budget*, which is hereby incorporated by reference.
- 3.2 "Project Director(s)" shall be as described in each Scope of Work, who shall be the principal investigator for the R&D Project.
- 3.3 "SPONSOR Liaison" shall be as described in each Scope of Work, a SPONSOR representative designated by SPONSOR to be the primary contact with the Project Director.
- 3.4 "Sponsored R&D Project" shall mean the Avista-sponsored research and development project covered by this Agreement for the performance by UNIVERSITY of the SCOPE OF WORK under the direction of the Project Director.
- 3.5 "SCOPE OF WORK" shall mean each scope of work for the Sponsored R&D Project, under the direction of the Project Director, and any other attachments which may provide additional information on the Sponsored project to be performed.

- 3.6 "Confidential Information" shall mean any information, experience or data regarding a disclosing PARTY's plans, programs, plants, processes, products, costs, equipment operations or customers, including without limitation algorithms, formulae, techniques, improvements, technical drawings and data, and computer software, whether in written, graphic, oral or other tangible form, considered confidential by the disclosing PARTY and protected by trade secret or other right of non-disclosure under the Idaho Public Records Act, I.C. §§ 9-337 through 9-350.
- 3.7 "Intellectual Property" shall mean any Invention, Copyright, Trademark, Mask Work, and/or Proprietary Information produced under the Scope of Work.
- 3.8 "Invention" shall mean certain inventions and/or discoveries conceived and reduced to practice during the period of performance of the Sponsored R&D Project and through performance of the Scope of Work, and resulting patents, divisionals, continuations, or substitutions of such applications, all reissues and foreign counterparts thereof, upon which a UNIVERSITY or SPONSOR employee or agent is or may be a named inventor.
- 3.9 "Invention Disclosure(s)" shall mean a written disclosure of a potentially patentable Invention(s) provided to SPONSOR and the UNIVERSITY's Technology Transfer Office.
- 3.10 "Copyright" shall mean any work developed under the Scope of Work that is subject to copyright under copyright law whether or not registered under federal copyright law, and including any and all moral rights thereto.
- 3.11 "Trademark" shall mean any trade or service marks developed under the Scope of Work whether or not registered under either state or federal trademark law, and including all related goodwill.
- 3.12 "Mask Work" shall mean any two or three dimensional layout or topology of an integrated circuit developed in the Sponsored R&D Project under the Scope of Work.

IV. SCOPE OF WORK

- 4.1 UNIVERSITY shall furnish the labor, materials, and equipment necessary to provide the Services applicable under this Agreement in accordance with written Scopes of Work, mutually agreed to by the Parties. Such Scopes of Work will be incorporated into this Agreement by this reference when executed by both Parties, a sample of which is included in this Agreement as *Attachment A-Budget*, *Attachment B-Scope of Work*.
- 4.2 Modifications to a Scope of Work requested by Avista will be performed in accordance with a written Change Order, mutually agreed to by the Parties. Change Orders will be incorporated into this Agreement by this reference upon execution by both Parties.
- 4.3 UNIVERSITY agrees to use its reasonable efforts to perform the SCOPE OF WORK in accordance with the terms and conditions of this Agreement. UNIVERSITY does not represent, warrant, or guarantee that the desired results will be obtained under this Agreement.
- 4.3 Kick Off Meeting/Reporting Requirements.

- 4.3.1 **Kick-off Meeting.** Within thirty (30) days of executing this Agreement and/or an associated Scope of Work, the UNIVERSITY will attend (either in person or telephonically) a kick-off meeting with the SPONSOR.
- 4.3.2 **Progress Reports.** UNIVERSITY shall provide a two page written report on the progress of the SCOPE OF WORK every six (6) months following the execution of such SCOPE OF WORK.
- 4.3.3 **Final Technical Report.** UNIVERSITY shall furnish a final written report within thirty (30) days of completion of the Period of Performance as defined in Section 5.1. This report will include at a minimum: a summary of project accomplishments, a summary of budget expenditures, stage and gates status, number of faculty utilized, student participation, and a status of the project and completion timelines. SPONSOR and UNIVERSITY will identify whether such the report will be presented in person or electronically in each SCOPE OF WORK.
- 4.3.4 **Final Financial Report.** A final financial report shall be furnished within sixty (60) days of completion of the Period of Performance as defined in Section 5.1.
- 4.4 **Third Party Project Manager.** SPONSOR will retain an independent third party to assist SPONSOR with monitoring milestones and deliverables for each Scope of Work. UNIVERSITY agrees to cooperate with such third party and provide any requested information in a timely manner.

V. GENERAL TERMS AND CONDITIONS

In consideration of the mutual premises and covenants contained herein, the PARTIES agree to the following terms and conditions.

- 5.1 **Period of Performance.** The specific period of performance for each project will be defined in each SCOPE OF WORK, and any changes will be mutually agreed upon in writing between the PARTIES in accordance with the Change Order process set forth in Section 4.2.
- 5.2 **Funding.** SPONSOR agrees to reimburse UNIVERSITY for services performed under in accordance with the payment schedule listed in each SCOPE OF WORK. Any unspent funding remaining upon SPONSOR's acceptance of UNIVERSITY's Final Technical Report under Section 4.3.3, above, and its Final Financial Report under Section 4.3.4, above, the expiration or term of the Agreement shall be returned to SPONSOR.
- 5.3 **Project Budget.** Each SCOPE OF WORK will set forth a Project Budget (see *Attachment A-Budget*). Deviations from this Project Budget may be made to and from any expenditure line item within the UNIVERSITY system, as long as such deviation is reasonable and necessary in the pursuit of the SCOPE OF WORK and pre-approved by SPONSOR. The total amount identified in each SCOPE OF WORK may not be exceeded without prior written agreement through a Change Order.
- 5.4 **Invoices.** Periodic invoices will be provided, in accordance with 5.2 using the standard UNIVERSITY invoice. Payments are due to UNIVERSITY within thirty (30) days from the UNIVERSITY invoice date.

Invoices should be sent to:

Name/Title: John Gibson Phone: 509-495-4115
Address: 1411 E. Mission Ave. E-mail: john.gibson@avistacorp.com
City/State/Zip: Spokane, WA 99220

- 5.5 Equipment. UNIVERSITY shall retain title to any equipment purchased with funds provided by SPONSOR under this Agreement.
- 5.6 Key Personnel. The Project Director may select and supervise other Sponsored R&D Project staff as needed to perform the SCOPE OF WORK. No other person will be substituted for the Project Director, except with SPONSOR's approval. SPONSOR may exercise Termination for Convenience provisions of this Agreement if a satisfactory substitute is not identified.
- 5.7 Control of Scope of Work. The control of the SCOPE OF WORK rests entirely with SPONSOR, but control of the performance of the UNIVERSITY and the Sponsored R&D Project staff in executing the SCOPE OF WORK within the Sponsored R&D Project shall rest entirely with UNIVERSITY. The PARTIES agree that UNIVERSITY, through its Project Director, shall maintain regular communication with the designated liaison for SPONSOR and the UNIVERSITY's Project Director and SPONSOR's Liaison shall mutually define the frequency and nature of such communications.
- 5.8 Confidential Information.
- 5.8.1 To the extent allowed by law, and subject to the publication provisions set forth in Section 5.9 below, UNIVERSITY and SPONSOR agree to use reasonable care to avoid unauthorized disclosure of Confidential Information, including without limitation taking measures to prevent creating a premature bar to a United States or foreign patent application. Each party will limit access to and any publication or disclosure of Confidential Information received from another party hereto and/or created and reduced to practice as a part of the Sponsored R&D Project, to those persons having a need to know. Each party shall employ the same reasonable safeguards in receiving, storing, transmitting, and using Confidential Information that prudent organizations normally exercise with respect to their own potentially patentable inventions and other confidential information of significant value.
- 5.8.2 Any Confidential Information shall be in written, graphic, or other tangible form or reduced to such form within thirty (30) days of disclosure and shall be clearly identified in writing as confidential at the time of or within thirty (30) days of disclosure. Confidential Information shall not be disclosed by the receiving party to a third party for a period of three (3) years from receipt of such information or until a patent is published or the Confidential Information of a Party is published by the disclosing party or unless the disclosing and receiving parties agree in writing prior to the time of disclosure to be bound by confidentiality provisions substantially similar to those set forth in this Agreement. Third parties shall include all governmental offices. Notwithstanding the above, any Intellectual Property arising out of, created or reduced to practice as a part of the Sponsored R&D Project shall be subject to the requirements set forth below in Section 5.9
- 5.8.3 The terms of confidentiality set forth in this Agreement shall not be construed to limit the parties' right to independently develop products without the use of another party's Confidential Information.

- 5.8.4 Confidential Information shall not include information which:
- i. was in the receiving party's possession prior to receipt of the disclosed information;
 - ii. is or becomes a matter of public knowledge through no fault of the receiving party;
 - iii. is received from a third party without a duty of confidentiality;
 - iv. is independently developed by the receiving party;
 - v. is required to be disclosed under operation of law, including but not limited to the Idaho Public Records Act, I.C. §§ 9-337 through 9-350;
 - vi. is reasonably ascertained by UNIVERSITY or SPONSOR to create a risk to a person involved in a clinical trial or to general public health and safety.

- 5.9 Publication. SPONSOR and UNIVERSITY acknowledge the need to balance SPONSOR's need to protect commercially feasible technologies, products, and processes, including the preservation of the patentability of Inventions arising out of, created in or reduced to practice as a part of the Sponsored R&D Project that fall within the SCOPE OF WORK, with UNIVERSITY's public responsibility to freely disseminate scientific findings for the advancement of knowledge. UNIVERSITY recognizes that the public dissemination of information based upon the SCOPE OF WORK performed under this Agreement cannot contain Confidential Information (unless authorized for disclosure per subsection 5.8.2 above), nor should it jeopardize SPONSOR or UNIVERSITY's ability to commercialize Intellectual Property developed hereunder. Similarly, SPONSOR recognizes that the scientific results of the Sponsored R&D Project may be publishable after SPONSOR's interests and patent rights are protected and, subject to the confidentiality provisions of this Agreement, may be presentable in forums such as symposia or international, national or regional professional meetings, or published in vehicles such as books, journals, websites, theses, or dissertations.

UNIVERSITY agrees not to publish or otherwise disclose SPONSOR Confidential Information, unless authorized in writing by SPONSOR. SPONSOR agrees that UNIVERSITY, subject to review by SPONSOR, shall have the right to publish results of the Sponsored R&D Project, excluding SPONSOR Confidential Information that is not authorized in writing to be disclosed by SPONSOR. SPONSOR shall be furnished copies of any proposed publication or presentation at least thirty (30) days before submission of such proposed publication or presentation. During that time, SPONSOR shall have the right to review the material for SPONSOR Confidential Information and to assess the patentability of any Invention described in the material. If SPONSOR decides that a patent application for an Invention should be filed or other Intellectual Property filing should be pursued, the publication or presentation shall be delayed an additional sixty (60) days or until a patent application or other application for protection of Intellectual Property is filed, whichever is sooner. At SPONSOR's request, SPONSOR Confidential Information shall be deleted to the extent permissible by and in compliance with UNIVERSITY's record retention obligations, provided, however that during such retention periods, UNIVERSITY shall maintain the SPONSOR Confidential Information in accordance with Section 5.8.

- 5.10 Publicity. Neither party shall use the name of the other party, nor any member of the other party's employees, nor either party's Trademarks in any publicity, advertising, sales promotion, news release, nor other publicity matter without the prior written approval of an authorized representative of that party.
- 5.11 Termination for Convenience. This Agreement or any individual Scope of Work may be terminated by either party hereto upon written notice delivered to the other party at least sixty (60) days prior to the date of termination. By such termination, neither party may nullify obligations already incurred prior to the date of termination. Upon receipt of any

such notice of termination, UNIVERSITY shall, except as otherwise directed by SPONSOR, immediately stop performance of the Services or Work to the extent specified in such notice. SPONSOR shall pay all reasonable costs and non-cancelable obligations incurred by UNIVERSITY as of the date of termination. UNIVERSITY shall use its reasonable efforts to minimize the compensation payable under this Agreement in the event of such termination.

- 5.12 Termination for Cause. Either Party may terminate this Agreement or an individual Scope of Work at any time upon 30 days' prior written notice in the event of a material breach by the other Party, provided the breaching Party has not cured such breach during such 30-day period. A material breach includes, without limitation, insolvency, bankruptcy, general assignment for the benefit of creditors, or becoming the subject of any proceeding commenced under any statute or law for the relief of debtors, or if a receiver, trustee or liquidator of any property or income of either Party is appointed, or if UNIVERSITY is not performing the Services in accordance with this Agreement or an individual Scope of Work.
- 5.13 Termination Obligations. In addition to those obligations set out in 5.11 and 5.12, any termination of this Agreement or an individual Scope of Work shall not relieve either party of any obligations incurred prior to the date of termination including, but not limited to, SPONSOR's responsibility to pay UNIVERSITY for all work performed through the date of termination, calculated on a pro-rata basis given the percentage of completion of the Sponsored R&D Project on the effective date of the termination, and for reimbursement to UNIVERSITY of all non-cancelable commitments already incurred for the terminated Sponsored R&D Project. Upon termination, UNIVERSITY shall promptly deliver to SPONSOR all Sponsored R&D Project deliverables, whether complete or still in progress, and all SPONSOR Confidential Information disclosed to UNIVERSITY in connection with the Sponsored R&D Project. Additionally, in the event Intellectual Property was created as a result of the Sponsored R&D Project, SPONSORS' rights to negotiate a license to such Intellectual Property shall apply pursuant to Section 5.16 below, and the parties' agree to execute any documents evidencing joint ownership, if applicable. The rights and obligations of Article 5.8 of this Agreement shall survive termination.
- 5.14 Dispute Resolution. Any and all claims, disputes or controversies arising under, out of, or in connection with this Agreement, which the parties hereto shall be unable to resolve within sixty (60) days, shall be mediated in good faith by the parties respective Vice Presidents for Research or equivalent.

Nothing in this Agreement shall be construed to limit the PARTIES' choice of a mutually acceptable dispute resolution method in addition to the dispute resolution procedure outlined above, or to limit the PARTIES rights to any remedy at law or in equity for breach of the terms of this Agreement and the right to receive reasonable attorney's fees and costs incurred in enforcing the terms of this Agreement.

- 5.15 Disclaimer. UNIVERSITY MAKES NO EXPRESS OR IMPLIED WARRANTY AS TO THE CONDITIONS OF THE SCOPE OF WORK, SPONSORED PROJECT OR ANY INTELLECTUAL PROPERTY, GENERATED INFORMATION, OR PRODUCT MADE OR DEVELOPED UNDER THIS AGREEMENT, OR THE MERCHANTABILITY, OR FITNESS FOR A PARTICULAR PURPOSE OF THE SPONSORED PROJECT, SCOPE OF WORK, OR RESULTING PRODUCT.

- 5.16 Intellectual Property.

- 5.16.1 UNIVERSITY Intellectual Property. UNIVERSITY shall own all rights and title to Intellectual Property created solely by UNIVERSITY employees.
- 5.16.2 SPONSOR Intellectual Property. SPONSOR shall own all rights and title to Intellectual Property created solely by SPONSOR and without use of UNIVERSITY resources under this Agreement.
- 5.16.3 JOINT Intellectual Property. UNIVERSITY and SPONSOR will jointly own any and all Intellectual Property developed jointly (e.g., to the extent the parties would be considered joint inventors and/or joint copyright holders, as applicable, under relevant U.S. intellectual property laws) under this Agreement.
- 5.16.4 Either party may file for and maintain Intellectual Property protections for Joint Intellectual Property developed under this Agreement. In the event that a party wants to obtain or maintain any Intellectual Property protections concerning Joint Intellectual Property, the other party agrees to execute any documentation reasonably requested.
- 5.16.5 Joint Intellectual Property shall be owned equally by the parties. Except as provided below, the parties agree: (i) to share equally all expenses incurred in obtaining and maintaining Intellectual Property protections on Joint Intellectual Property, and (ii) that each party shall have the right to license such Joint Inventions to third parties (with the right to sublicense) without accounting to the other and without the consent of the other. In the event that consent by each joint owner is necessary for either joint owner to license the Joint Intellectual Property, the parties hereby consent to the other party's grant of one or more licenses under the Joint Intellectual Property to third parties and shall execute any document or do any other act reasonably requested to evidence such consent.
- 5.16.7 Notwithstanding the foregoing, a party may decide at any time that it does not want to financially support Intellectual Property protections for certain Joint Intellectual Property (a "Non-Supporting Party"). In that case, the other party is free to seek and obtain such Intellectual Property protections at its own expense (a "Supporting Party"), provided that title to any such Intellectual Property protections shall still be held jointly by the parties.
- 5.16.8 UNIVERSITY will promptly disclose to SPONSOR in writing any Intellectual Property made during the Project performed hereunder. Such disclosure shall be sufficiently detailed for SPONSOR to assess the commercial viability of the technology and shall be provided and maintained by SPONSOR in confidence pursuant to the terms of Article 5.8. SPONSOR shall have up to ninety (90) days from the receipt of the disclosure to inform UNIVERSITY whether it elects to have UNIVERSITY file a patent application or otherwise seek Intellectual Property protection pursuant to the procedures set forth below.
- 5.16.9 All rights and title to UNIVERSITY Intellectual Property shall be subject to SPONSOR's licensing options below and belong to UNIVERSITY. UNIVERSITY hereby grants to SPONSOR an option to negotiate a license to any Intellectual Property in which SPONSOR wishes to pursue, which license shall be in a form substantially the same as set forth in Attachment C. Such license shall be exclusive within SPONSOR's field of commercial interest, unless otherwise agreed upon by the parties. In addition, SPONSOR shall have, for any exclusive

license in Intellectual Property executed by the Parties, the right to sublicense the Intellectual Property, unless otherwise agreed upon by the parties. The terms and conditions of such license including royalties, territory and field of use are to be negotiated in good faith and agreed upon between UNIVERSITY and SPONSOR. SPONSOR's option to license any Intellectual Property shall, for each Invention or other Intellectual Property disclosed by UNIVERSITY to SPONSOR, under Section 5.16.8, extend for ninety (90) days after such disclosure. SPONSOR shall have upon exercise of its option to license, ninety (90) days to negotiate the terms of the license, which period can be extended by mutual written agreement of the Parties. In the event that SPONSOR does not exercise its option as to any disclosed Invention or Intellectual Property, consistent with specified time period set forth above, or the parties fail to reach a mutually acceptable license agreement within the above specified time period, UNIVERSITY shall be entitled to negotiate in good faith with one or more third parties a license to the Intellectual Property.

- 5.16.10 UNIVERSITY, after due consultation with SPONSOR, shall promptly file and prosecute patent applications, using counsel of UNIVERSITY's choice. Because UNIVERSITY and SPONSOR have a common legal interest in the prosecution of such applications, UNIVERSITY shall keep SPONSOR advised as to all developments with respect to application(s) and shall promptly supply copies of all papers received and filed in connection with the prosecution in sufficient time for SPONSOR to comment. SPONSOR understands and agrees that such exchange of information may include privileged information and that by such an exchange in furtherance of the common interests of the parties, the UNIVERSITY does not intend to waive the attorney/client privilege, attorney work product immunity, common interest privilege, and/or any other applicable privilege, protection, or immunity. SPONSOR's comments shall be taken into consideration. SPONSOR shall reimburse UNIVERSITY for all reasonable out-of-pocket costs incurred in connection with such preparation, filing, and prosecution of patent(s). SPONSOR shall not be responsible for any fees under this Section if SPONSOR elects not to exercise its option under Section 5.16.9 other than fees incurred by the UNIVERSITY acting in consultation with SPONSOR.
- 5.16.11 Within nine (9) months of the filing date of a U.S. patent application, SPONSOR shall provide to UNIVERSITY a written list of foreign countries in which applications should be filed. If SPONSOR elects to discontinue financial support of any patent prosecution, in any country, UNIVERSITY shall be free to continue prosecution at UNIVERSITY's expense. In such event, UNIVERSITY shall have no further obligation to SPONSOR in regard to such patent applications or patents.
- 5.16.12 UNIVERSITY, subject to its Copyright policy, hereby grants to SPONSOR a royalty-free license to use Copyright material to which UNIVERSITY holds the copyright, with the exception of copyrighted software, for its non-commercial use. UNIVERSITY hereby grants to SPONSOR the right to negotiate a license for commercial use of Copyrighted material to which UNIVERSITY holds the copyright on reasonable terms and conditions, including a reasonable royalty, as the PARTIES hereto agree in a subsequent writing.
- 5.16.13 SPONSOR understands that UNIVERSITY must comply with the provisions of US Patent law, including the Bayh-Dole Act.

5.16.14 No party shall invoke the CREATE ACT (Cooperative Research and Technology Enhancement Act of 2004 and subsequent amendments and implementing regulations) without written consent of the other party. In the event that a party invokes the Act without such prior consent, any patent issued arising out of such invocation will be owned by the non-invoking party.

5.17 Indemnity and Hold Harmless. SPONSOR shall fully indemnify and hold harmless the state of Idaho, UNIVERSITY and its governing board, officers, employees, and agents from and against any and all costs, losses, damages, liabilities, expenses, demands, and judgments, including court costs and reasonable attorney's fees, which may arise out of SPONSOR'S activities under or related to this Agreement and SPONSOR's negligent conduct. Additionally, SPONSOR shall fully indemnify and hold harmless the state of Idaho, UNIVERSITY and its governing board, officers, employees, and agents from and against any and all costs, losses, damages, liabilities, expenses, demands, and judgments, including court costs and reasonable attorney's fees, which may arise out of SPONSOR's use, commercialization, or distribution of information, materials or products which result in whole or in part from the research performed pursuant to this Agreement, provided, however, that SPONSOR shall not indemnify UNIVERSITY for any claims resulting directly from UNIVERSITY's lack of ownership or infringement of a third-party's intellectual property rights.

In the event that any such Loss is caused by the negligence of both Parties, including their employees, agents, suppliers and subcontractors, the Loss shall be borne by the Parties in the proportion that their respective negligence bears to the total negligence causing the Loss, provided, however, that any Loss borne by the University shall be subject to the limits of liability specified in Idaho Code 6-901 through 6-929, known as the Idaho Tort Claims Act.

5.18 Amendments. This Agreement may be amended by mutual agreement of the PARTIES. Such amendments shall not be binding unless they are in writing and signed by personnel authorized to bind each of the PARTIES.

5.19 Assignment. The work to be provided under this Agreement, and any claim arising hereunder, is not assignable or delegable by either party in whole or in part, without the express prior written consent of the other party.

5.20 Notices. Any notice or communication required or permitted under this Agreement shall be delivered in person, by overnight courier, or by registered or certified mail, postage prepaid and addressed to the party to receive such notice at the address given below or such other address as may hereafter be designated by notice in writing. Notice given hereunder shall be effective as of the date of receipt of such notice:

UNIVERSITY:

Name/Title: Polly Knutson

Address: 875 Perimeter Dr. MS 3020

City/State/Zip: Moscow, ID 83843-3020

Phone: (208) 885-6651

Fax: (208) 885-5752

E-mail: *osp* @uidaho.edu

SPONSOR:

Name/Title: John Gibson Mgr Dist Opm.

Address: 1411 E. Mission Ave.

City/State/Zip: Spokane, WA 99220

Phone: 509-495-4115

E-mail: john.gibson@avistacorp.com

- 5.21 Governing Law; Jurisdiction and Venue; Attorneys' Fees. This Agreement shall be construed and interpreted in accordance with the laws of the state of Idaho, without regard to its choice of law provisions. Any legal proceeding instituted between the parties shall be in the courts of the County of Latah, State of Idaho, and each of the parties agrees to submit to the jurisdiction of such courts. In the event any legal action is commenced to construe, interpret or enforce this Agreement, the prevailing party shall be entitled to an award against the non-prevailing party for all of the prevailing party's reasonable attorneys' fees, costs and expenses incurred in such action, including any appeals.
- 5.22 Compliance with Laws. SPONSOR understands that UNIVERSITY and SPONSOR are subject to United States laws and federal regulations, including the export of technical data, computer software, laboratory prototypes and other commodities (including the Arms Export Control Act, as amended, and the Export Administration Act of 1979), and that SPONSOR's and UNIVERSITY's obligations hereunder are contingent upon compliance with applicable United States laws and regulations, including those for export control. The transfer of certain technical data and commodities may require a license from a cognizant agency of the United States Government and/or a written assurance by SPONSOR that SPONSOR shall not transfer data or commodities to certain foreign countries without prior approval of an appropriate agency of the United States Government. UNIVERSITY nor SPONSOR represent that a license shall not be required, nor that, if required, it will be issued.
- 5.23 Severability. If any provision of this Agreement or any provision of any document incorporated by reference shall be held invalid, such invalidity shall not affect the other provisions of this Agreement which can be given effect without the invalid provision, if such remainder conforms to the requirements of applicable law and the fundamental purpose of this Agreement, and to this end the provisions of this Agreement are declared to be severable.
- 5.24 No Joint Venture. Nothing contained in this agreement shall be construed as creating a joint venture, partnership, or agency relationship between the parties.
- 5.25 Force Majeure. Any prevention, delay or stoppage due to strikes, lockouts, labor disputes, acts of God, inability to obtain labor or materials or reasonable substitutes therefore, governmental restrictions, governmental regulations, governmental controls, enemy or hostile governmental action, civil commotion, fire or other casualty, and other causes beyond the reasonable control of the party obligated to perform (except for financial ability), shall excuse the performance, except for the payment of money, by such party for a period equal to any such prevention, delay or stoppage.
- 5.27 Delegation and Subcontracting. UNIVERSITY shall not (by contract, operation of law or otherwise) delegate or subcontract performance of any Services to any other person or entity without the prior written consent of SPONSOR. Any such delegation or subcontracting without SPONSOR's prior written consent will be voidable at SPONSOR's option. No delegation or subcontracting of performance of any of the Services, with or without SPONSOR's prior written consent, will relieve UNIVERSITY of its responsibility to perform the Services in accordance with this Agreement.
- 5.28 Entire Agreement; Order of Precedence. This Agreement contains all the terms and conditions agreed upon by the PARTIES. No other understandings, oral or otherwise, regarding the subject matter of this Agreement shall be deemed to exist or to bind any of

the PARTIES hereto. In the event of an inconsistency in this Agreement, the inconsistency shall be resolved by giving precedence in the following order:

1. Applicable statutes and regulations;
2. Terms and Conditions contained in the Agreement;
3. Any attachments or addendums; and
4. Any other provisions incorporated by reference or otherwise into this Agreement.

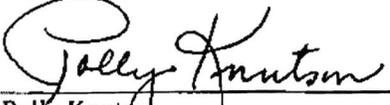
IN WITNESS WHEREOF, the PARTIES hereto have caused this Agreement to be executed as of the date set forth herein by their duly authorized representatives.

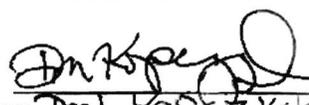
UNIVERSITY

SPONSOR

UNIVERSITY OF IDAHO

AVISTA CORPORATION

By: 
Name: Polly Knutson
Title: Director of Research Administration
Date: 6/4/14

By: 
Name: DON KOPEZYŃSKI
Title: VP, OPERATIONS
Date: 6/6/14

Ad 6/3/2014
JK 6-3-14

APPENDIX C BOISE STATE UNIVERSITY AGREEMENT

SPONSORED RESEARCH AND DEVELOPMENT PROJECT AGREEMENT

I. PARTIES

- 1.1 THIS AGREEMENT is made and entered into by and between Boise State University, an Idaho state institution of higher education (UNIVERSITY), and Avista Corporation, a Washington corporation (SPONSOR). In this Agreement, the above entities are sometimes referred to as a Party and jointly referred to as Parties.

II. PURPOSE

- 2.1 This Agreement provides the terms and conditions for an Avista-sponsored energy efficiency applied research and development project which is of mutual interest and benefit to UNIVERSITY and SPONSOR, and which has been approved by the Idaho Public Utilities Commission under Order 32918.
- 2.2 The performance of such sponsored research and development project is consistent with UNIVERSITY's status as a non-profit, tax-exempt, educational institution, and may derive benefits for SPONSOR, UNIVERSITY, and society by the advancement of knowledge in the field of study identified. The performance of such sponsored research and development projects may also derive benefits for SPONSOR through the development of energy efficiency products and/or services that could be offered to Avista customers in Idaho and other jurisdictions and/or licensed or sold to other utilities or their customers by Avista.
- 2.3 UNIVERSITY's capabilities reflect a substantial public investment, which UNIVERSITY, as a part of its mission as a state higher education institution, wishes to utilize in a cooperative and collaborative effort with SPONSOR, including substantial financial investment in sponsored research and development projects, as described below.

III. DEFINITIONS

- 3.1 "Budget" shall mean the Project Budget contained in *Attachment A-Budget*, which is hereby incorporated by reference.
- 3.2 "Project Director(s)" shall be as described in each Scope of Work, who shall be the principal investigator for the R&D Project.
- 3.3 "SPONSOR Liaison" shall be as described in each Scope of Work, a SPONSOR representative designated by SPONSOR to be the primary contact with the Project Director.
- 3.4 "Sponsored R&D Project" shall mean the Avista-sponsored research and development project covered by this Agreement for the performance by UNIVERSITY of the Scope of Work under the direction of the Project Director.
- 3.5 "Scope of Work" shall mean each scope of work for the Sponsored R&D Project, under the direction of the Project Director, and any other attachments that may provide additional information on the Sponsored project to be performed.

- 3.6 "Confidential Information" shall mean any information, experience or data regarding a disclosing Party's plans, programs, plants, processes, products, costs, equipment operations or customers, including without limitation algorithms, formulae, techniques, improvements, technical drawings and data, and computer software, whether in written, graphic, oral or other tangible form, designated in writing as confidential by the disclosing Party at the time of disclosure to the receiving Party.
- 3.7 "Intellectual Property" shall mean any Invention, Copyright, Trademark, Mask Work, and/or Proprietary Information produced under the Scope of Work.
- 3.8 "Invention" shall mean certain inventions and/or discoveries conceived and reduced to practice during the period of performance of the Sponsored R&D Project and through performance of the Scope of Work, and resulting patents, divisionals, continuations, or substitutions of such applications, all reissues and foreign counterparts thereof, upon which a UNIVERSITY or SPONSOR employee or agent is or may be a named inventor.
- 3.9 "Invention Disclosure(s)" shall mean a written disclosure of a potentially patentable Invention(s) provided to SPONSOR and/or the UNIVERSITY's Technology Transfer Office.
- 3.10 "Copyrighted Material" shall mean any work developed under the Scope of Work that is subject to copyright under copyright law whether or not registered under federal copyright law, and including any and all moral rights thereto.
- 3.11 "Trademark" shall mean any trade or service marks developed under the Scope of Work whether or not registered under either state or federal trademark law, and including all related goodwill.
- 3.12 "Mask Work" shall mean any two or three dimensional layout or topology of an integrated circuit developed in the Sponsored R&D Project under the Scope of Work.
- 3.13 "Equipment" shall mean tangible personal property (including information technology systems) having a useful life of more than one year and a per-unit acquisition cost exceeding \$5,000.00.
- 3.14 "Supplies" shall mean all tangible personal property other than Equipment.

IV. SCOPE OF WORK; NO WARRANTY

- 4.1 UNIVERSITY shall furnish the labor, materials, and equipment necessary to provide the services applicable under this Agreement in accordance with written Scopes of Work, mutually agreed to by the Parties. Such Scopes of Work will be incorporated into this Agreement by this reference when executed by both Parties, a sample of which is included in this Agreement as *Attachment A-Budget, Attachment B-Scope of Work*.
- 4.2 Modifications to a Scope of Work requested by SPONSOR will be performed in accordance with a written Change Order, mutually agreed to by the Parties. Change Orders will be incorporated into this Agreement by this reference upon execution by both Parties. For SPONSOR, a Change Order may be signed by either SPONSOR or by SPONSOR'S Third Party Project Manager.
- 4.3 UNIVERSITY agrees to use its reasonable efforts to perform the services outlined in any Scope of Work in accordance with the terms and conditions of this Agreement.

UNIVERSITY DOES NOT REPRESENT, WARRANT, OR GUARANTEE THAT THE DESIRED RESULTS WILL BE OBTAINED UNDER THIS AGREEMENT. ADDITIONALLY, UNIVERSITY MAKES NO REPRESENTATION AS TO THE PATENTABILITY OR PROTECTABILITY OF ANY INTELLECTUAL PROPERTY CREATED UNDER THIS AGREEMENT.

- 4.3 Kick Off Meeting/Reporting Requirements.
- 4.3.1 Kick-off Meeting. Within thirty (30) days of executing this Agreement and/or an associated Scope of Work, the UNIVERSITY will attend (either in person or telephonically) a kick-off meeting with the SPONSOR.
- 4.3.2 Progress Reports. UNIVERSITY shall provide a two page written report on the progress of the Scope of Work every six (6) months following the execution of such Scope of Work.
- 4.3.3 Final Technical Report. UNIVERSITY shall furnish a final written report within thirty (30) days of completion of the Period of Performance as defined in Section 5.1. This report will include at a minimum: a summary of project accomplishments, a summary of budget expenditures, stage and gates status, number of faculty utilized, student participation, and a status of the project and completion timelines. SPONSOR and UNIVERSITY will identify whether such the report will be presented in person or electronically in each Scope of Work.
- 4.3.4 Final Financial Report. A final financial report shall be furnished within sixty (60) days of completion of the Period of Performance as defined in Section 5.1.
- 4.4 Third Party Project Manager. SPONSOR will retain an independent third party to assist SPONSOR with monitoring milestones and deliverables for each Scope of Work. UNIVERSITY agrees to cooperate with such third party and provide any requested information in a timely manner.

V. GENERAL TERMS AND CONDITIONS

In consideration of the mutual premises and covenants contained herein, the Parties agree to the following terms and conditions.

- 5.1 Period of Performance. The specific period of performance for each project will be defined in each Scope of Work, and any changes will be mutually agreed upon in writing between the Parties in accordance with the Change Order process set forth in Section 4.2.
- 5.2 Funding. SPONSOR agrees to reimburse UNIVERSITY for services performed in accordance with the payment schedule listed in each Scope of Work. Any unspent funding remaining after UNIVERSITY completes each Scope of Work and associated reporting requirements shall be returned to SPONSOR.
- 5.3 Project Budget. Each Scope of Work will set forth a Project Budget (see *Attachment A-Budget*). Deviations from this Project Budget may be made to and from any expenditure line item within the UNIVERSITY system, as long as such deviation is reasonable and necessary in the pursuit of the Scope of Work and pre-approved by SPONSOR, provided however that UNIVERSITY shall not be required to receive prior written approval for amounts less than \$500. The total amount identified in each Scope of Work may not be exceeded without prior written agreement through a Change Order.

- 5.4 Invoices. Periodic invoices will be provided, in accordance with 5.2 using the standard UNIVERSITY invoice. Payments are due to UNIVERSITY within thirty (30) days from the UNIVERSITY invoice date.

Invoices should be sent to:

Name/Title: John Gibson Phone: 509-495-4115
Address: 1411 E. Mission Ave. E-mail: john.gibson@avistacorp.com
City/State/Zip: Spokane, WA 99220

- 5.5 Equipment and Supplies. UNIVERSITY shall retain title to any Equipment and Supplies purchased with funds provided by SPONSOR under this Agreement.
- 5.6 Key Personnel. The Project Director may select and supervise other Sponsored R&D Project staff as needed to perform the Scope of Work. No other person will be substituted for the Project Director, except with SPONSOR's approval. SPONSOR may exercise Termination for Convenience provisions of this Agreement if a satisfactory substitute is not identified.
- 5.7 Control of Scope of Work. The control of the Scope of Work rests entirely with SPONSOR, but control of the performance of the UNIVERSITY and the Sponsored R&D Project staff in executing the Scope of Work within the Sponsored R&D Project shall rest entirely with UNIVERSITY. The Parties agree that UNIVERSITY, through its Project Director, shall maintain regular communication with the designated liaison for SPONSOR and the UNIVERSITY's Project Director and SPONSOR's Liaison shall mutually define the frequency and nature of such communications.
- 5.8 Confidential Information.
- 5.8.1 To the extent allowed by law, and subject to the publication provisions set forth in Section 5.9 below, UNIVERSITY and SPONSOR agree to use reasonable care to avoid unauthorized disclosure of Confidential Information, including without limitation taking measures to prevent creating a premature bar to a United States or foreign patent application. Each Party will limit access to, and any publication or disclosure of, Confidential Information received from another Party hereto and/or created and reduced to practice as a part of the Sponsored R&D Project, to those persons having a need to know. Each Party shall employ the same reasonable safeguards in receiving, storing, transmitting, and using Confidential Information that each Party normally exercises with respect to its own potentially patentable inventions and other confidential information of significant value.
- 5.8.2 Confidential Information shall not be disclosed by the receiving Party to a third party: (i) for a period of three (3) years from receipt of such Confidential Information; or (ii) until a patent is published or the Confidential Information of a Party is published by the disclosing Party; or (iii) UNIVERSITY and SPONSOR mutually agree to such release in a writing signed by both Parties. Notwithstanding the above, any Intellectual Property arising out of, created or reduced to practice as a part of the Sponsored R&D Project shall be subject to the requirements set forth below in Section 5.9

5.8.3 The terms of confidentiality set forth in this Agreement shall not be construed to limit the parties' right to independently develop products without the use of another Party's Confidential Information.

5.8.4 Confidential Information shall not include information which:

- i. was in the receiving Party's possession prior to receipt of the disclosed information;
- ii. is or becomes a matter of public knowledge through no fault of the receiving Party;
- iii. is received from a third party without a duty of confidentiality;
- iv. is independently developed by the receiving Party;
- v. is required to be disclosed under operation of law, including but not limited to the Idaho Public Records Act, I.C. §§ 9-337 through 9-350;
- vi. is reasonably ascertained by UNIVERSITY or SPONSOR to create a risk to a person involved in a clinical trial or to general public health and safety.

5.9 Publication. SPONSOR and UNIVERSITY acknowledge the need to balance SPONSOR's need to protect commercially feasible technologies, products, and processes, including the preservation of the patentability of Inventions arising out of, created in or reduced to practice as a part of the Sponsored R&D Project that fall within the Scope of Work, with UNIVERSITY's public responsibility to freely disseminate scientific findings for the advancement of knowledge. UNIVERSITY recognizes that the public dissemination of information based upon the Scope of Work performed under this Agreement cannot contain Confidential Information (unless authorized for disclosure per subsection 5.8.2 above), nor should it jeopardize SPONSOR or UNIVERSITY's ability to commercialize Intellectual Property developed hereunder. Similarly, SPONSOR recognizes that the scientific results of the Sponsored R&D Project may be publishable after SPONSOR's interests and patent rights are protected and, subject to the confidentiality provisions of this Agreement, may be presentable in forums such as symposia or international, national or regional professional meetings, or published in vehicles such as books, journals, websites, theses, or dissertations.

UNIVERSITY and SPONSOR each agree not to publish or otherwise disclose SPONSOR Confidential Information or UNIVERSITY Confidential Information, unless authorized in writing by the disclosing Party. SPONSOR agrees that UNIVERSITY, subject to review by SPONSOR, shall have the right to publish results of the Sponsored R&D Project, excluding SPONSOR Confidential Information that is not authorized in writing to be disclosed by SPONSOR. SPONSOR shall be furnished copies of any proposed publication or presentation at least thirty (30) days before submission of such proposed publication or presentation. During that time, SPONSOR shall have the right to review the material for SPONSOR Confidential Information and to assess the patentability of any Invention described in the material. If SPONSOR decides that a patent application for an Invention should be filed or other Intellectual Property filing should be pursued, the publication or presentation shall be delayed an additional sixty (60) days or until a patent application or other application for protection of Intellectual Property is filed, whichever is sooner. At SPONSOR's request, SPONSOR Confidential Information shall be deleted to the extent permissible by and in compliance with UNIVERSITY's record retention obligations, provided, however that during such retention periods, UNIVERSITY shall maintain the SPONSOR Confidential Information in accordance with Section 5.8.

5.10 Publicity. Neither Party shall use the name of the other Party, nor any member of the other Party's employees, nor either Party's Trademarks in any publicity, advertising,

sales promotion, news release, nor other publicity matter without the prior written approval of an authorized representative of that Party.

- 5.11 Termination for Convenience. This Agreement or any individual Scope of Work may be terminated by either Party hereto upon written notice delivered to the other Party at least sixty (60) days prior to the date of termination. By such termination, neither Party may nullify obligations already incurred prior to the date of termination. Upon receipt of any such notice of termination, UNIVERSITY shall, except as otherwise directed by SPONSOR, immediately stop performance of the services or Work to the extent specified in such notice. SPONSOR shall pay all reasonable costs and non-cancelable obligations incurred by UNIVERSITY as of the date of termination. UNIVERSITY shall use its reasonable efforts to minimize the compensation payable under this Agreement in the event of such termination.
- 5.12 Termination for Cause. Either Party may terminate this Agreement or an individual Scope of Work at any time upon thirty (30) days' prior written notice in the event of a material breach by the other Party, provided the breaching Party has not cured such breach during such 30-day period. A material breach includes, without limitation, insolvency, bankruptcy, general assignment for the benefit of creditors, or becoming the subject of any proceeding commenced under any statute or law for the relief of debtors, or if a receiver, trustee or liquidator of any property or income of either Party is appointed, or if UNIVERSITY is not performing the services in accordance with this Agreement or an individual Scope of Work.
- 5.13 Termination Obligations. In addition to those obligations set out in 5.11 and 5.12, any termination of this Agreement or an individual Scope of Work shall not relieve either Party of any obligations incurred prior to the date of termination including, but not limited to, SPONSOR's responsibility to pay UNIVERSITY for all work performed through the date of termination, calculated on a pro-rata basis given the percentage of completion of the Sponsored R&D Project on the effective date of the termination, and for reimbursement to UNIVERSITY of all non-cancelable commitments already incurred for the terminated Sponsored R&D Project. Upon termination, UNIVERSITY shall promptly deliver to SPONSOR all Sponsored R&D Project deliverables, whether complete or still in progress, and all SPONSOR Confidential Information disclosed to UNIVERSITY in connection with the Sponsored R&D Project. Additionally, in the event Intellectual Property was created as a result of the Sponsored R&D Project, SPONSORS' rights to negotiate a license to such Intellectual Property shall apply pursuant to Section 5.16 below, and the parties' agree to execute any documents evidencing joint ownership, if applicable. The rights and obligations of Article 5.8 of this Agreement shall survive termination.
- 5.14 Dispute Resolution. Any and all claims, disputes or controversies arising under, out of, or in connection with this Agreement, which the Parties hereto shall be unable to resolve within sixty (60) days, shall be mediated in good faith by the Parties' respective Vice Presidents for Research or equivalent.

Nothing in this Agreement shall be construed to limit the Parties' choice of a mutually acceptable dispute resolution method in addition to the dispute resolution procedure outlined above, or to limit the Parties' rights to any remedy at law or in equity for breach of the terms of this Agreement and the right to receive reasonable attorney's fees and costs incurred in enforcing the terms of this Agreement.

- 5.15 Disclaimer. UNIVERSITY MAKES NO EXPRESS OR IMPLIED WARRANTY AS TO THE CONDITIONS OF THE SCOPE OF WORK, SPONSORED PROJECT OR ANY INTELLECTUAL PROPERTY, GENERATED INFORMATION, OR PRODUCT MADE OR DEVELOPED UNDER THIS AGREEMENT, OR THE MERCHANTABILITY, OR FITNESS FOR A PARTICULAR PURPOSE OF THE SPONSORED PROJECT, SCOPE OF WORK, OR RESULTING PRODUCT.
- 5.16 Intellectual Property.
- 5.16.1 UNIVERSITY Intellectual Property. UNIVERSITY shall own all rights and title to Intellectual Property created solely by UNIVERSITY employees.
- 5.16.2 SPONSOR Intellectual Property. SPONSOR shall own all rights and title to Intellectual Property created solely by SPONSOR and without use of UNIVERSITY resources under this Agreement.
- 5.16.3 JOINT Intellectual Property. UNIVERSITY and SPONSOR will jointly own any and all Intellectual Property developed jointly (e.g., to the extent the parties would be considered joint inventors and/or joint copyright holders, as applicable, under relevant U.S. intellectual property laws) under this Agreement.
- 5.16.4 Either Party may file for and maintain Intellectual Property protections for Joint Intellectual Property developed under this Agreement. In the event that a Party wants to obtain or maintain any Intellectual Property protections concerning Joint Intellectual Property, the nonfiling Party agrees to execute any associated documentation reasonably requested.
- 5.16.5 Joint Intellectual Property shall be owned equally by the parties. Except as provided below, the parties acknowledge: (i) to share equally all expenses incurred in obtaining and maintaining Intellectual Property protections on Joint Intellectual Property, and (ii) that each Party shall have the right to license such Joint Inventions to third parties (with the right to sublicense) without accounting to the other and without the consent of the other.
- 5.16.6 Reserved.
- 5.16.7 Notwithstanding the foregoing, a Party may decide at any time that it does not want to financially support Intellectual Property protections for certain Joint Intellectual Property (a "Non-Supporting Party"). In that case, the other Party is free to seek and obtain such Intellectual Property protections at its own expense (a "Supporting Party"). provided that title to any such Intellectual Property protections shall still be held jointly by the parties.
- 5.16.8 UNIVERSITY and SPONSOR will promptly disclose to the other Party in writing any Intellectual Property made during the services performed hereunder. Such disclosure by UNIVERSITY shall be sufficiently detailed for SPONSOR to assess the commercial viability of the technology and shall be provided and maintained by SPONSOR in confidence pursuant to the terms of Article 5.8. SPONSOR shall have up to ninety (90) days from the receipt of the disclosure to inform UNIVERSITY whether it elects to have UNIVERSITY file a patent application or otherwise seek Intellectual Property protection pursuant to the procedures set forth below.

5.16.9 UNIVERSITY hereby grants to SPONSOR an option to negotiate an exclusive license under any UNIVERSITY Intellectual Property rights that SPONSOR wishes to pursue (the "Negotiation Right"). UNIVERSITY agrees to negotiate in good faith to attempt to establish the terms of a license agreement granting the SPONSOR the exclusive rights to make, have made, use, sell, offer to sell, export and import products in the applicable field of use under the applicable Intellectual Property rights. Such license agreement shall be in accordance with policies, procedures and guidelines set out by the Idaho State Board of Education, and shall include at least the following provisions: a license fee, annual maintenance payments/minimum royalties, milestone payments (where applicable) and royalty payments, payment of all past and future costs incurred by UNIVERSITY associated with the protection, prosecution and maintenance of the UNIVERSITY Intellectual Property rights, the limited right to grant sublicenses, sublicense fees, a commitment by the SPONSOR and any approved sub-licensees to exert best efforts to introduce licensed products into public use as rapidly as practicable, the right of UNIVERSITY to terminate the license agreement should the SPONSOR not meet any negotiated due diligence milestones, a commitment to maintain the confidentiality of any UNIVERSITY Confidential Information under Intellectual Property Rights, and indemnity and insurance provisions satisfactory to UNIVERSITY. Additionally, any license will include a reservation of rights for UNIVERSITY to use the Intellectual Property Rights for research, teaching and other lawful purposes of the UNIVERSITY. Notwithstanding anything in this Agreement to the contrary, this Agreement shall only require the Parties to negotiate in good faith to attempt to enter into a license, and shall not require either Party to enter into such a license unless the terms and conditions for such license are satisfactory to such Party in its sole discretion. SPONSOR's Negotiation Right shall, for Intellectual Property disclosed by UNIVERSITY to SPONSOR under Section 5.16.8, extend for ninety (90) days after such disclosure (the "Negotiation Period"). SPONSOR shall have upon exercise of its Negotiation Right, ninety (90) days to negotiate the terms of the license, which period can be extended by mutual written agreement of the Parties. In the event that SPONSOR does not exercise its Negotiation Right as to any disclosed Invention or Intellectual Property within the Negotiation Period or the parties fail to reach a mutually acceptable license agreement within the above specified time period: (i) SPONSOR'S Negotiation Right shall end; and (ii) UNIVERSITY shall be entitled to negotiate in good faith with one or more third parties an exclusive or nonexclusive license to the Intellectual Property in its sole discretion.

5.16.10 UNIVERSITY, after due consultation with SPONSOR, shall promptly file and prosecute patent applications on UNIVERSITY Intellectual Property to which SPONSOR exercised its Negotiation Right during the Negotiation Period, using counsel of UNIVERSITY's choice. Because UNIVERSITY and SPONSOR have a common legal interest in the prosecution of such applications, UNIVERSITY shall keep SPONSOR advised as to all developments with respect to application(s) and shall promptly supply copies of all papers received and filed in connection with the prosecution in sufficient time for SPONSOR to comment. SPONSOR understands and agrees that such exchange of information may include privileged information and that by such an exchange in furtherance of the common interests of the parties, the UNIVERSITY does not intend to waive the attorney/client privilege, attorney work product immunity, common interest privilege, and/or any other applicable privilege, protection, or immunity. SPONSOR's comments shall be taken into consideration. SPONSOR shall

reimburse UNIVERSITY for all reasonable out-of-pocket costs incurred in connection with such preparation, filing, and prosecution of patent(s). SPONSOR shall be responsible for all such costs under this Section until SPONSOR notifies UNIVERSITY in writing that SPONSOR desires to discontinue its financial support; provided, however, SPONSOR shall also be responsible for all costs incurred by UNIVERSITY after the date of notice under this Section and which are reasonably related to SPONSOR'S prior guidance to UNIVERSITY.

5.16.11 Within nine (9) months of the filing date of a U.S. patent application, SPONSOR shall provide to UNIVERSITY a written list of foreign countries in which applications should be filed. SPONSOR shall provide UNIVERSITY advance funding for all foreign applications/filings. If SPONSOR elects to discontinue financial support of any patent prosecution, in any country, UNIVERSITY shall be free to continue prosecution at UNIVERSITY's expense. In such event, UNIVERSITY shall have no further obligation to SPONSOR in regard to such patent applications or patents.

5.16.12 UNIVERSITY, subject to its Copyright policy, hereby grants to SPONSOR a non-exclusive, royalty-free, non-sublicenseable license to use Copyrighted Material to which UNIVERSITY holds the Copyright, with the exception of copyrighted software (which shall be licensed in accordance with Section 5.16.9 above), for its internal, non-commercial use.

5.16.13 SPONSOR understands that UNIVERSITY must comply with the provisions of US Patent law, including the Bayh-Dole Act.

5.16.14 No Party shall invoke the CREATE ACT (Cooperative Research and Technology Enhancement Act of 2004 and subsequent amendments and implementing regulations) without written consent of the other Party.

5.17 Indemnity and Hold Harmless. SPONSOR shall fully indemnify and hold harmless the state of Idaho, UNIVERSITY and its governing board, officers, employees, and agents from and against any and all costs, losses, damages, liabilities, expenses, demands, and judgments, including court costs and reasonable attorney's fees, which may arise out of SPONSOR'S activities under or related to this Agreement and SPONSOR's negligent conduct. Additionally, SPONSOR shall fully indemnify and hold harmless the state of Idaho, UNIVERSITY and its governing board, officers, employees, and agents from and against any and all costs, losses, damages, liabilities, expenses, demands, and judgments, including court costs and reasonable attorney's fees, which may arise out of SPONSOR's use, commercialization, or distribution of information, materials or products which result in whole or in part from the research performed pursuant to this Agreement, provided, however, that SPONSOR shall not indemnify UNIVERSITY for any claims resulting directly from UNIVERSITY's lack of ownership or infringement of a third-party's intellectual property rights.

In the event that any such loss is caused by the negligence of both Parties, including their employees, agents, suppliers and subcontractors, the loss shall be borne by the Parties in the proportion that their respective negligence bears to the total negligence causing the loss; provided, however, that any loss borne by the UNIVERSITY shall in any event only be to the extent allowed by Idaho law, including, without limitation, the limits of liability specified in Idaho Code 6-901 through 6-929, known as the Idaho Tort Claims Act.

- 5.18 Amendments. This Agreement may be amended by mutual agreement of the Parties. Such amendments shall not be binding unless they are in writing and signed by personnel authorized to bind each of the Parties.
- 5.19 Assignment. The work to be provided under this Agreement, and any claim arising hereunder, is not assignable or delegable by either Party in whole or in part, without the express prior written consent of the other Party, except as required by Idaho law, policy or regulation.
- 5.20 Notices. Any notice or communication required or permitted under this Agreement shall be delivered in person, by overnight courier, or by registered or certified mail, postage prepaid and addressed to the Party to receive such notice at the address given below or such other address as may hereafter be designated by notice in writing. Notice given hereunder shall be effective as of the date of receipt of such notice:

UNIVERSITY:

Name/Title: Matt Smith, Contract Officer
Phone: (208) 426-1425
Address: 1910 University Drive
E-mail: mattsmith2@boisestate.edu
City/State/Zip: Boise, ID 83725-1135

SPONSOR:

Name/Title: John Gibson, Mgr Dist Opm.
Phone: 509-495-4115
Address: 1411 E. Mission Ave.
E-mail: john.gibson@avistacorp.com
City/State/Zip: Spokane, WA 99220

- 5.21 Governing Law; Jurisdiction and Venue; Attorneys' Fees. This Agreement shall be construed and interpreted in accordance with the laws of the state of Idaho, without regard to its choice of law provisions. Any legal proceeding instituted between the parties shall be in the courts of the County of Ada, State of Idaho, and each of the parties agrees to submit to the jurisdiction of such courts. In the event any legal action is commenced to construe, interpret or enforce this Agreement, the prevailing Party shall be entitled to an award against the non-prevailing Party for all of the prevailing Party's reasonable attorneys' fees, costs and expenses incurred in such action, including any appeals.
- 5.22 Compliance with Laws. SPONSOR understands that UNIVERSITY and SPONSOR are subject to United States laws and federal regulations, including the export of technology (i.e., technical data and technical assistance), computer software, laboratory prototypes and other commodities (including the Arms Export Control Act, as amended, the Export Administration Act of 1979 and associated implementing regulations and executive orders), and that SPONSOR's and UNIVERSITY's obligations hereunder are contingent upon compliance with applicable United States laws and regulations, including those for export control. The transfer of certain technology and commodities, even within the borders of the United States, may require a license from a cognizant agency of the United States Government and/or a written assurance by SPONSOR that SPONSOR shall not transfer technology, software or commodities to certain foreign persons or countries without prior approval of an appropriate agency of the United States Government. Neither UNIVERSITY nor SPONSOR represent that a license shall not be required, nor that, if required, it will be issued.

- 5.23 Severability. If any provision of this Agreement or any provision of any document incorporated by reference shall be held invalid, such invalidity shall not affect the other provisions of this Agreement which can be given effect without the invalid provision, if such remainder conforms to the requirements of applicable law and the fundamental purpose of this Agreement, and to this end the provisions of this Agreement are declared to be severable.
- 5.24 No Joint Venture. Nothing contained in this Agreement shall be construed as creating a joint venture, partnership, or agency relationship between the parties.
- 5.25 Force Majeure. Any prevention, delay or stoppage due to strikes, lockouts, labor disputes, acts of God, inability to obtain labor or materials or reasonable substitutes therefore, governmental restrictions, governmental regulations, governmental controls, enemy or hostile governmental action, civil commotion, fire or other casualty, and other causes beyond the reasonable control of the Party obligated to perform (except for financial ability), shall excuse the performance, except for the payment of money, by such Party for a period equal to any such prevention, delay or stoppage.
- 5.27 Delegation and Subcontracting. UNIVERSITY shall not (by contract, operation of law or otherwise) delegate or subcontract performance of any services to any other person or entity without the prior written consent of SPONSOR. Any such delegation or subcontracting without SPONSOR's prior written consent will be voidable at SPONSOR's option. No delegation or subcontracting of performance of any of the services, with or without SPONSOR's prior written consent, will relieve UNIVERSITY of its responsibility to perform the services in accordance with this Agreement.
- 5.28 Entire Agreement; Order of Precedence. This Agreement contains all the terms and conditions agreed upon by the Parties. No other understandings, oral or otherwise, regarding the subject matter of this Agreement shall be deemed to exist or to bind any of the Parties hereto. In the event of an inconsistency in this Agreement, the inconsistency shall be resolved by giving precedence in the following order:
1. Applicable statutes and regulations;
 2. Terms and Conditions contained in the Agreement;
 3. Any attachments or addendums; and
 4. Any other provisions incorporated by reference or otherwise into this Agreement.

IN WITNESS WHEREOF, the Parties hereto have caused this Agreement to be executed as of the date set forth herein by their duly authorized representatives.

UNIVERSITY

BOISE STATE UNIVERSITY

By: 
 Name: Karen Henry
 Title: Executive Director
 Date: 10/21/14

SPONSOR

AVISTA CORPORATION

By: 
 Name: Don Kopczewski
 Title: VP OPERATIONS
 Date: 10/20/14

**ATTACHMENT A – BUDGET
UNIVERSITY # _____**

Budget Categories	%	Mths	Year 1	Total
Salaries				
PI Dr. Said Ahmed-Zaid Academic Year		0.0	-	-
PI Dr. Said Ahmed-Zaid Summer	0.15	0.45	4,282	4,282
Graduate Research Assistant		12	27,000	27,000
			<u>31,282</u>	<u>31,282</u>
Fringe Benefits				
		%		
PI Dr. Said Ahmed-Zaid Academic Year		0.32	-	-
PI Dr. Said Ahmed-Zaid Summer		0.32	1,370	1,370
Graduate Research Assistant		0.07	1,890	1,890
			<u>3,260</u>	<u>3,260</u>
Student Costs				
Graduate Student Fee Remission AY & 6 summer thesis credits			11,987	11,987
Total Student Costs			<u>11,987</u>	<u>11,987</u>
Total Direct Costs			<u>46,529</u>	<u>46,529</u>
Base for Indirect Calculation			34,542	34,542
Indirect Costs (F&A) 39% On-Campus Research			13,471	13,471
Total Costs			<u>60,000</u>	<u>60,000</u>

Avista Energy Research Proposal Residential Static VAR Compensator

Boise State University

PRINCIPAL INVESTIGATOR:

Dr. Said Ahmed-Zaid

PROJECT OBJECTIVES

This proposal is broken down into the following tasks during the first phase (year 1):

1. Phase I-A: Design and simulate the RSVC prototype using an appropriate software package that reflects real-world components as close as possible. Design and size the (variable) inductor, (fixed) capacitor, solid-state switches, and filtering circuits if needed.
2. Phase I-B: Test the simulated RSVC using a distribution system simulator such as EPRI's OpenDSS and evaluate the power and/or energy savings in a small-scale distribution system.
3. Phase I-C: Perform a cost-benefit analysis based on the results of the pilot study and estimate the payback period for this apparatus

RESOURCE COMMITMENTS:

1. Project manager and supervisor: Dr. Said Ahmed-Zaid (78 hours)
2. M.S. Graduate Research Assistant: Mr. Muhammad Latif (1300 hours)

PROJECT PLAN

Background

Conservation by Voltage Reduction (CVR) is the implementation of a distribution voltage strategy whereby all voltages are lowered to the minimum allowed by the equipment manufacturer. This is a consequence of the observation that many loads consume less power when they are fed with a voltage lower than nominal. In order to guarantee a good quality service, loads should not be supplied with a voltage higher or lower than 5% of nominal. A range of standard service voltages used in the United States is specified by the American National Standards Institute (ANSI) as 120 volts nominal, 114 volts minimum (120 V minus 5%) and 126 volts maximum (120 V plus 5%).

Despite the regulatory history, electrical companies are forced to become more efficient and more competitive by working to reduce costs. One such big cost is when a company buys costly energy from another utility in the market when it cannot satisfy its own demand with its own installed capacity. Furthermore, distribution companies, as well as final customers, must pay a higher price per kWh during

peak demand hours. The goal of our proposed residential CVR implementation is to reduce power consumption during peak hours in order to save energy and costs.

Before applying CVR, power system operators and analysts must also understand the characteristics of their loads. Even if all loads consumed less power with less voltage, which is generally not true, we would not be saving energy in all cases. Some devices can give good service by working at a lower voltage. For example, decreasing the voltage of a lightbulb will definitely yield energy savings. However, there are other devices, such as air conditioners and ovens, which will have to work longer to give the same service. So in the end, we may not be saving energy and, instead, it is possible to consume even more. Whereas lowering the voltage may increase line current losses, the decrease in power consumption is expected to be bigger, so that the overall balance will be positive [1-5].

Project Objective

Since the implementation of a conservation by voltage reduction (CVR) system is beyond the scope of this project, we are proposing instead to develop a solution based on the concept of a Residential Static VAR Compensator (RSVC) for regulating residential voltages, especially during peak demand hours, when the benefits coincide best with the interests of customers and those of the electric companies. These RSVCs will be an additional tool for smart demand-side management. By controlling remotely the RSVC, a utility can apply CVR at specified individual locations during specified periods. Our goal is to develop such an RSVC prototype and we will leave it to the electric utility companies to develop strategies for conservation by voltage regulation. Our solution involves installing an individual apparatus which will decrease the voltage before each customer's service. This may not be cheap but many independent studies (with different authors and procedures) have proved the great profit that can be achieved by working with CVR and these additional costs can be justified over the long term [1-5]. In other words, the cost of implementing CVR per kWh saved would be smaller than buying that amount of kWh in the market. A question remains as to whether the payback for the initial cost investment will be in the range of three to five years.

Our previous experience with two senior design projects on CVR and where we tested the current and power sensitivities of many common household appliances to voltage regulation has provided us with general conclusions and guidance regarding the feasibility of this method. Another potential benefit of these individual residential devices is that they can also be used by utilities with high penetrations of distributed energy sources that would normally complicate the implementation of a global CVR system for energy reduction.

Project Timeline for Phase I and Project Deliverables

Work would commence when the contract is executed. From that point, we anticipate completing work in 12 months with an interim report at the sixth month point. The timeline is illustrated below, assuming a start date of November 1, 2014.

Task	Start Date	Duration	Comments
Prototype Design	11/1/2014	2 months	Design a prototype based on end-user needs and specifications, marketing requirements, customer constraints, budget, and safety constraints.
Prototype Simulation	1/1/2015	3 months	Simulation the prototype using a suitable software package with realistic components and controls.
Interim Report	4/1/2015	1 month	This is a progress report on the status of the project including simulation results.
Prototype Testing	5/1/2015	4 months	Test the RSVC using EPRI's OpenDSS with a pilot

			study of a typical small-scale distribution system.
Final Report	9/1/2015	2 months	Deliver a final report with details of the prototype design, results of the testing, and a cost-benefit analysis of payback period based on the pilot study.

POTENTIAL MARKET PATH

If the results of this research indicate that a residential (single-phase) static var compensator (RSVC) offers a significant potential for energy savings by voltage regulation, it can become a valuable tool in a utility's demand-side management for energy efficiency, especially during peak demand hours. The prototype design and cost will be evaluated for a 10-kVA, single-phase, 2000 square feet, residential home with a typical load between 1.5 kVA to 20 kVA. The design can easily be scaled up for larger residential homes, buildings, and even neighborhoods with single-phase or three-phase distribution transformers.

CRITERIA FOR MEASURING SUCCESS

Success will be measured by three criteria:

1. A successful design of a prototype that automatically regulates the service voltage of a residential home in the range of 114 V to 126 V (plus or minus 5% of nominal). The prototype will be demonstrated in simulation in Phase I and, if desired by Avista, in hardware during Phase II.
2. A successful simulation test of the operation of these devices in a distribution system simulator (such as EPRI's OpenDSS) using realistic models of common household appliances.
3. A cost-benefit analysis based on the results of the above simulation that would yield the allowable cost for such devices in order to aim for a payback period of three to five years.

REFERENCES

- [1] Kennedy, W. and R.H. Fletcher, "Conservation Voltage Reduction at Snohomish County PUD." IEEE Transactions on Power Systems, vol. 6, no. 3, pp. 986-998, August 1991.
- [2] Erickson, J.C. and S.R. Gilligan, "The Effects of Voltage Reduction on Distribution Circuit Loads," IEEE Transactions on Power Apparatus and Systems, vol. PAS-101, no. 7, pp. 2014-2018, July 1982.
- [3] Warnock, V.J. and T.L. Kirkpatrick, "Impact of Voltage Reduction on Energy and Demand: Phase II," IEEE Transactions on Power Systems, vol. PWRS-1, no. 2, pp. 92-95, May 1986.
- [4] Fletcher, R.H. and A. Saeed, "Integrating Engineering and Economic Analysis for Conservation Voltage Reduction." IEEE 2002 Summer Meeting, 0-7803-7519-x/02, pp. 725-730.
- [5] Lefebvre, S., G. Gaba, A.-O. Ba, D. Asber, A. Ricard, C. Perreault, and D. Chartrand, "Measuring the Efficiency of Voltage Reduction at Hydro-Quebec Distribution," PES General Meeting – Conversion and Delivery of Electrical Energy in the 21st Century, pp. 1-7, Pittsburgh, PA, 20-24, July 2008, IEEE 2008.

APPENDIX D INTERIM REPORT
Increasing Hydropower Generating Efficiency through Drag Reduction



Increasing Hydropower Generating Efficiency through Drag Reduction

Interim Report

Project Duration: 12 months

Project Cost: Total Funding \$ 72,539

2014 Funding \$ 2,723(spent)

2015 Funding \$ 69,816

Stage of Path to Market for this Proposal (Market with x)

1__ 2__ 3_X 4__ 5__ 6__ 7__ 8__

OBJECTIVE

Energy loss due to friction occurs at various phases of hydropower generation. This research investigates the potential of reducing the energy loss in the penstock so that more energy is available for power generation.

BUSINESS VALUE

Even a small amount of frictional drag reduction in the penstock can result in significant energy production increase over time because the effect is cumulative. The drag reduction is possible by treating the inner wall of concrete penstocks with a nanoparticle-based water proofing agent. Such an agent is inexpensive and the treatment effect can last 20 to 30 years, making the improvement economically attractive.

INDUSTRY NEED

It is not uncommon that many hydropower generating plants are 30 to 50 years old. Many have gone through electronic, electrical and mechanical equipment overhaul or upgrades. Penstocks, however, can only be maintained. New sciences and technologies on surfaces have developed over the same 30- to 50- year time span. The industry can benefit from such advances resulting in increased efficiency in power generation.

BACKGROUND

Fluid viscosity, however small, causes shearing of the fluid layer at and near the wall

of a penstock. This shearing consumes energy and reduces the energy available to the turbines for electric power generation.

The concrete/cement surface of penstock inner walls is hydrophilic. Nanotechnology has made it possible to make these surfaces hydrophobic or even super-hydrophobic. Zycosil, a nanoparticle-based water-proving agent, makes concrete/cement surfaces hydrophobic.

In theory, flow along hydrophobic surfaces should experience less shearing than over hydrophilic surfaces. Some elaborate measurements have demonstrated frictional drag reduction over precision-etched metal super-hydrophobic surfaces. Frictional drag reduction by hydrophobicity over concrete surface treated with Zycosil has not been demonstrated or quantified.

This project evaluates the potential of frictional drag reduction over Zycosil-treated surfaces. The evaluation is being carried out that the Hydraulics Laboratory of the University of Idaho.

SCOPE

Quantifying frictional drag reduction is to be carried out through laboratory measurements of wall shear stress. Listed below are the originally envisioned tasks. Some have been modified as a result of the knowledge gained during this investigation. Listed below are of the tasks and their status.

1. Organize project team: completed.

2. Prepare test flume: completed.
3. Construct specimen carrier: completed but use discontinued due to insufficient sensitivity. An alternative using hanging plate now replaces the specimen carrier.
4. Determine sensor sensitivity and specimen size: Nearly completed as of Feb 28, 2015. This task turned out to be difficult due to the high sensitivity require to detect very small changes in wall shear stress. The original proposed approach of force measurement on the specimen carrier was abandoned due to low achievable sensitivity. We are now using hanging plates instead. Preliminary results indicate that the measured frictional drag forces are reasonable in magnitude and shows the correct trend of variation with Reynolds number. The hanging plate approach is a unique direct shear drag measurement and-, to our knowledge, not reported in the literature. Three additional shear drag measurement approaches are being pursued. These are: Preston tube, velocity profile, and pressurized pipe flow head loss. All measurement approaches are necessary for this project.
5. Conduct test on sand-papered surfaces: In progress for hanging plates for some time. Preliminary measurements using the other three approaches from task 4 have been made. Refinement of the measurement details are evolving as of Feb. 28, 2015.
6. Quantifying Super-hydrophobicity: In progress. We have obtained some scanning electron microscopic (SEM) images of micron-sized roughness coated with nanoparticles. The next step is to quantify SEM images, to estimate the contact angles of droplets on treated surfaces, and to relate the SEM information with the contact angle. Note that so far the Zycosil treated surfaces exhibited hydrophobicity but not super-hydrophobicity.
7. Conduct additional tests on Sand papered plates: Pending.
8. Prepare concrete specimen: Pending but we have created some hydrophobic concrete surfaces.

9. Concrete specimen Testing: Pending. The testing is to be made using Preston tube and velocity profile approaches.
10. Data analysis and additional testing: Pending.
11. Evaluation of efficiency gain: Pending.
12. Preparing final report: Pending.

An additional phase of the research, after drag reduction has been established, is to carry out field testing and the development of field implementation details. (This additional phase is not funded in the current project.)

DELIVERABLES

The final report is the deliverable of this project. This report will document the work performed to demonstrate and quantify drag reduction in the laboratory.

PROJECT TEAM

Dr. Jim C. P. Liou, PI, Dept. of Civil Engineering, University of Idaho, 208-885-6202, liou@uidaho.edu

Dr. Brian Johnson, Co-PI, Dept. of Electrical Engineering, University of Idaho, 208-885-6902, bjohnson@uidaho.edu

Five Civil Engineering Seniors: William Kirby, Taylor Romenesko, Dmitriy Shimberg, Terrence Stevenson, and Adam Storey.

BUDGET FROM PROPOSAL

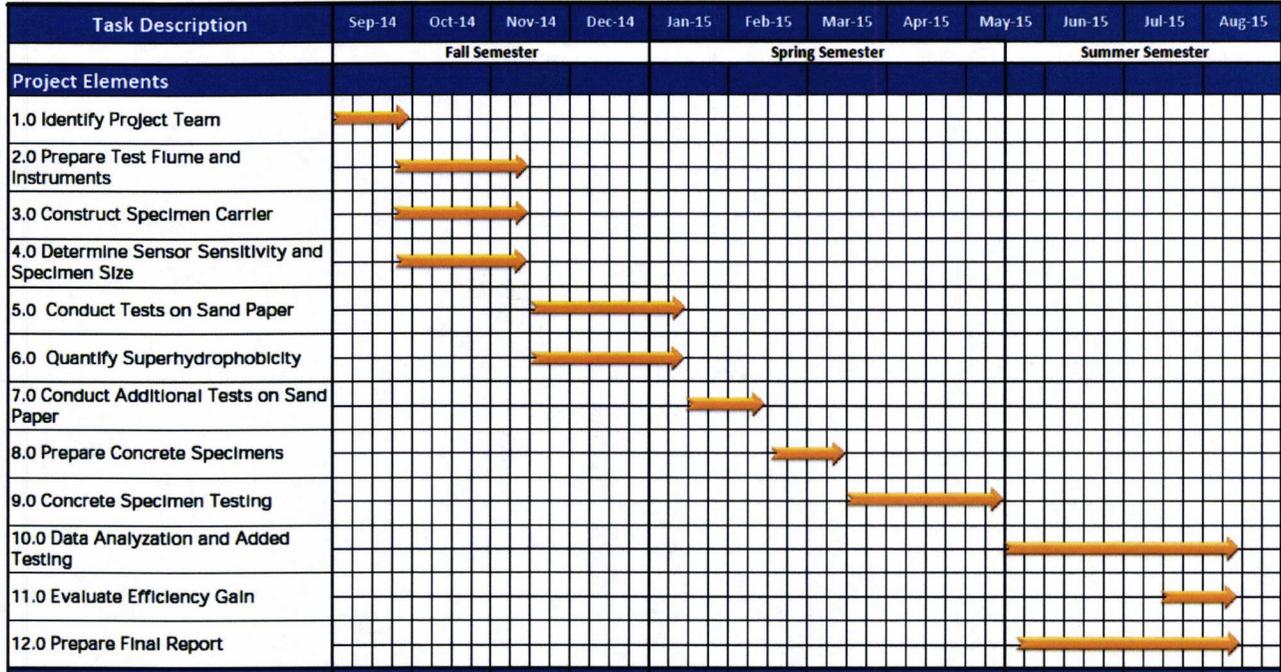
Item	\$
1. Salaries, Wages, and Fringe	
1.A <i>Liou, PI, Johnson, Co-PI</i>	4,390
1.B <i>one graduate student RA</i>	24,476
1.C <i>one undergraduate RA</i>	5,219
2. Travel	1,000
3. Supplies and Services	
3.A <i>Materials and supplies</i>	6,000
3.B <i>SEM services</i>	2,000
4. Grad student RA Tuition/SHIP	9,936
Total Direct Cost	53,021
Indirect Cost	19,518
Total Cost	72,539

A satisfactory graduate student was not available at the start of the project. The need was filled by five civil engineering seniors. Budget items 1.B, IC and 4 are used to pay these five students.

SCHEDULE

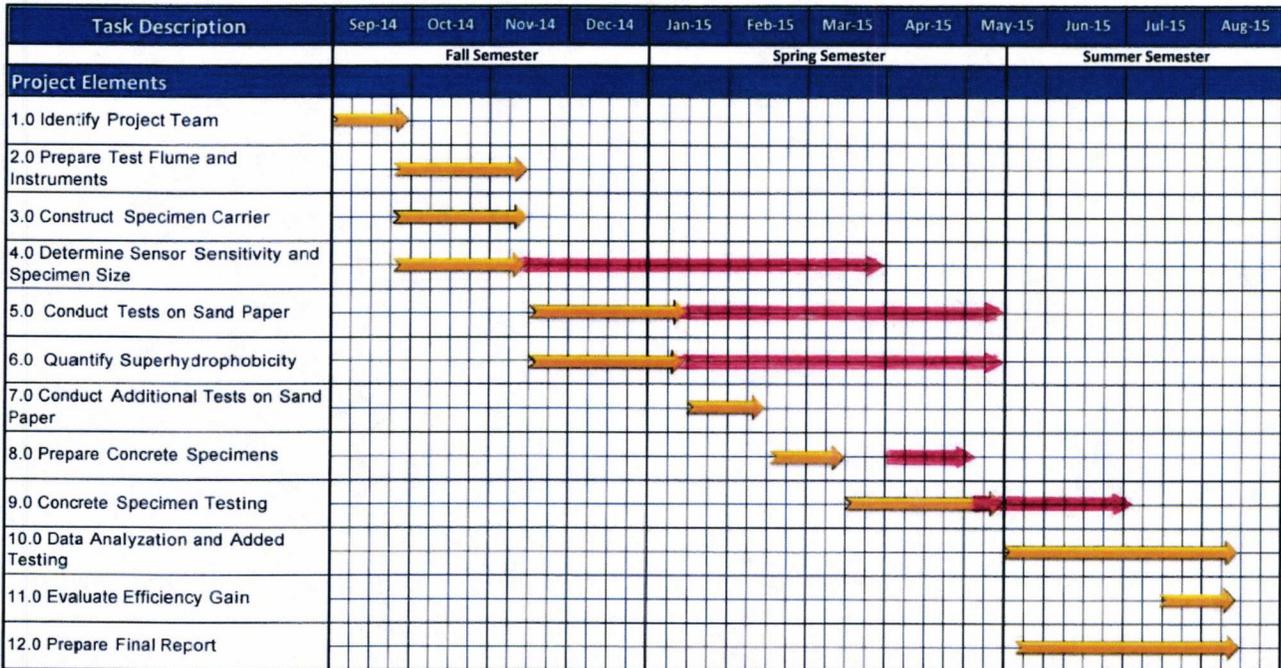


The original schedule is shown below.



Tasks 1 through 4, (with task 4 significantly expanded as described above) have been essentially completed on schedule. Tasks 5 and 6 are in progress. Task 6 will be more complex than expected and will take more time. This task is not in the critical path to other scheduled tasks. Unexpected difficulties have slowed down some tasks but we are essentially on schedule.

The current schedule is shown below.



APPENDIX E INTERIM REPORT
Bidirectional Charger Effects on Local Electrical Grids

Bidirectional Charger Effects on Local Electrical Grids with Limited Access

Project Duration: 10 months

Project Cost: Total Funding \$78,697

2014 Funding \$6,568

2015 Funding \$72,129

Stage of Path to Market Work: (marked with X)

1----2----3--X-4----5----6

Stage 3: Metering and test

OBJECTIVE

With the increasing popularity of electrical vehicles and the anticipated decrease in their purchase prices over the next several years, electrical vehicles are coming to every commercial and academic campus.

On-site charging is a benefit that many employers may want to provide. We propose to build a bidirectional charging system on a university campus, a system that operates within the voltages and power levels typical of a home or small commercial building. We will use this charger to investigate the effects of bidirectional charging on the electrical utility system within the building and on nearby buildings. From the data collected, we will identify the appropriate issues, from which we will prepare a larger proposal near the end of this project's term for a follow-on campus-wide investigation.

BUSINESS VALUE

Electric vehicles are becoming popular. Charging stations on commercial campuses are likely to become an employee benefit. Being able to reliably predict the effects of these charging stations on the local power grid provides Avista with better means to oversee construction. Contractors can then more efficiently build these facilities and, where appropriate, install mitigation methods.

INDUSTRY NEED

Plenty of service infrastructures exist for gas-exclusive vehicles, but hybrid or electric vehicles don't have very many charging stations outside of certain areas.

Providing these stations will not only provide a convenience factor to customers, the stations will also allow power to be purchased from customer's vehicles through discharging. This power can be used to help correct demand and power quality issues.

This project proposes to develop a prototype in conjunction with experimentation to determine the feasibility of such a station. If successful, the project would allow areas that typically have higher outage rates to receive a more consistent delivery of power, provide local energy storage station to expedite the mitigation of power quality issues.

BACKGROUND

Charge and discharge of electrical vehicles and hybrids may generate some electrical disturbances. Those will be more noticeable in small systems such as houses or small neighborhoods. In order to evaluate those effects we're going to simulate a small grid using the Gauss Johnson building.

The vehicle charging/discharging point should mitigate the possible power quality problems that it may generate in order to have a stable system without significant power quality problems. Corrective actions and hardware may be necessary, as this project should determine. Varying levels of load, and hence, power quality problems, should be investigated.

SCOPE

Task 1: Equipment Selection

A preliminary task in order to conduct all the project is the selection and purchase of all the necessary equipment needed for the correct project development.

The main equipment needed:

- 2 bi-directional chargers
- 4 Power quality meters

Task 2: Equipment Installation

This task includes the installation of the batteries, bi-directional chargers and power quality meters. Meters are needed to measure the effects of the bi-directional chargers on the building power system.

The selection of the metering points has been done in order to obtain as many different conditions as possible inside the building. Planned meter test points are as follows for the Gauss Johnson building:

1. By the bidirectional chargers.
2. By the computer lab in the GJ building.
3. In the power laboratory (closest to the point of common coupling).
4. The furthest possible points away from the both chargers.

Task 3: Metering and Tests

This task includes the automated collection of data from the different power meters. Standard scientific methods apply. Control data will first be obtained for different conditions around the building at different times.

Different operations of the chargers will be performed in order to create as many different situations as possible. During those different conditions many power quality issues may appear such as sags or harmonics.

Task 4: Data Evaluation

The study of the data will show what types of power quality problems we encounter in the building grid and which of those are produced or aggravated by the chargers.

Task 5: Solutions to the Power Quality Problems

With the data analysis we can then develop and implement solutions to the power quality problems on the grid and test them.

Possible solutions may include: Using batteries, or the cars, or the chargers in reverse, as an uninterruptible power supply.

Task 6: Final Report

This task includes the Final Report with all the results from the experiment as well as the models and proposed solutions.

DELIVERABLES

The deliverables for this project will be:

- Models to predict performance of charging stations with similar characteristics and similar locations.
- Predictions for electrical system behavior when a number of these charging stations are operating.
- Mitigation solutions to the power quality problems generated by the charging stations.

PROJECT TEAM

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SCHEDULE

TASK	TIME ALLOCATED	START DATE	FINISH DATE
Equipment Selection	1 months	Jan'15	Feb'15
Equipment Installation	1 months	Feb'15	Apr'15
Metering and Tests	2 month	Mar'15	Jul'15
Data Evaluation	1 months	Mar'15	Jun'15
Solutions to the Power Quality Problems	2 months	Mar'15	Aug'15
Final Report	1 month	Apr'15	Aug'15

APPENDIX F INTERIM REPORT
Simulation-Based Commissioning of EMCS



2014 Proposal
Simulation-Based Commissioning of
Energy Management Control Systems

Project Duration: 10 months

Project Cost: OTD Total Funding	\$46,705
OTD 2014 Funding	\$7,904
OTD 2015 Funding	\$38,801 (anticipated)
Cofunding	\$0

Stage of Path to Market Work for this Proposal: (marked with X)
 1----2----3--X--4----5
Stage 3: BCVTB Model Development

OBJECTIVE

The research aims to develop a method to use energy simulation and co-simulation software to perform automated and semi-automated pre-commissioning or retro-commissioning (Cx) of the programming that resides inside a constructed building’s energy management control system (EMS). This phase of the research is to complete manual proof of concept work, benchmark baseline performance of chosen test site, and estimate energy savings potential via simulation of alternate building control strategies.

BUSINESS VALUE

The potential value to Avista and Avista customers are energy savings, reduced cost of commissioning, improved human comfort in buildings, reduce duration to achieve proper operation of new buildings, and increased Avista’s visibility of energy end use data in buildings that implement the tools. A conservative estimate of 2.5% energy savings across the US Commercial Market is anticipated and this equate to approximately 380 TBtu nationally. Approximately \$25% reduction in Cx costs is estimated, equivalent to ~ \$0.029/SF per USDOE database.

INDUSTRY NEED

This research will enable Avista incentive programs or their other value-added energy services to improve the effectiveness of new building commissioning, existing building retro-commissioning, promote new and innovative designs for high performance buildings, and increase visibility of the

variability in customers end use energy consumption.

BACKGROUND

Previous related research using co-simulation was conducted at UI-IDL for NEEA’s emerging technology program on a rooftop direct/indirect evaporative and DX cooling unit in 2013. Other researchers have shown the potential of simulation to support CX efforts. UI-IDL has written proposals to DOE, and has plans for additional proposals to DOE and BPA to support related research, building upon this project.

SCOPE

Task 1 Project Planning- Conduct team meetings to calibrate expectations and select a building. Conduct ongoing project update meetings as required by Avista staff..

Task 2 Develop Energy Model – Using Energy Plus, develop and calibrate the energy model for the selected building. Exact HVAC system types will be modeled. Run simulations, determine end use energy, and establish baseline.

Task 3 BCVTB Model Development – Integrate the selected system’s BACnet programming with the BCVTB software and Energy Plus model.

Task 4 Run and Analyze – Run the co-simulation between Energy Plus and the BACnet programming. Determine end use energy and analyze differences between this and baseline model.

Task 5 Benchmark Pre/Post Performance – Conduct physical benchmarking of the constructed building to compare predicted performance with modeled performance.

DELIVERABLES

Test site building selected; EnergyPlus model constructed; EnergyPlus model calibrated to demonstration building equipment and occupancy schedules; Co-simulation results between BCVTB and EnergyPlus; Final report.

PROJECT TEAM

Avista: Tom Lienhard, Bryce Eschenbacher, Levi Westra.

Project Manager: JR Norvel, TO Engineers

University of Idaho:

Principle Investigator – Kevin Van Den Wymelenberg, PhD (kevinv@uidaho.edu;
208.724.9456)

Research Scientist – Brad Acker, PE

Budget Specialist – Eric Fredback

PhD Student – Damon Woods

Graduate Student – Tyler Noble

BUDGET

See attached budget by category.

Task 1 - \$8,356

Task 2 - \$7,803

Task 3 - \$22,601

Task 4 - \$5,505

Task 5 - \$2,440

SCHEDULE

Task 1 – 8/1/2014 – 8/15/2015

Task 2 – 11/1/2014 – 4/10/2015

Task 3 – 2/20/2015 – 5/15/2015

Task 4 – 5/18/2015 – 6/26/2015

Task 5 – 2/20/2015 – 8/15/2015

APPENDIX G INTERIM REPORT
Residential Static VAR Compensator:



2014 Proposal

Residential Static VAR Compensator

Project Duration: 10 months

Project Cost: OTD Total Funding \$60,000
OTD 2014 Funding \$12,000
OTD 2015 Funding \$48,000

Stage of Path to Market Work for this Proposal: (marked with X)

1-----2-----3--X-4-----5

Stage 3: Prototype Testing

OBJECTIVE

To develop a smart demand-side management device based on the concept of a Residential Static VAR Compensator (RSVC) for regulating residential voltages, especially during peak demand hours.

BUSINESS VALUE

Distribution utilities pay a higher price per kWh for managing load demand above base load during peak hours. The proposed residential static VAR compensator reduces power consumption during peak hours in order to save energy and costs of generation.

INDUSTRY NEED

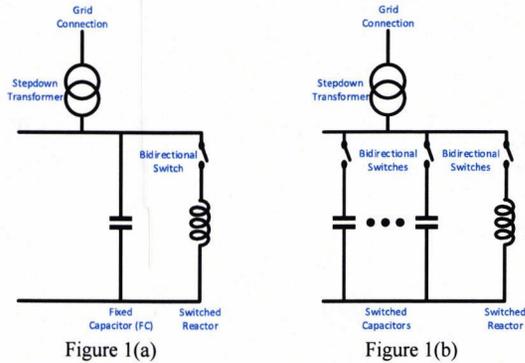
Distribution utilities must purchase enough generation capacity to manage load during peak hours. Amid rising energy costs and increasing stress on the grid, utilities are looking towards alternative methods to regulate and reduce energy consumption. A device is needed that dynamically optimizes voltage levels via sophisticated smart grid technologies to continuously reduce energy consumption and demand during peaks hours when electricity prices are inflated and demand may exceed the available capacity. Studies¹ have shown that reducing distribution service voltage by 1% lowers energy consumption by about 0.8%. This translates to significant kilowatt-hour (kWh) savings at a price range from below 1¢ to 5¢ per kWh--far lower than most new generation sources cost. In other words, the cost of implementing "conservation by voltage reduction per kWh" would be lower than buying that amount of kWh in the market.

BACKGROUND

Conservation by Voltage Reduction (CVR) is the implementation of a distribution voltage strategy whereby all voltages are lowered to the minimum allowed by the utility standard (ANSI c84.1). This is based on the observation that many loads consume less power when they are fed with a voltage lower than nominal. To maintain a good quality of service, loads should not be supplied with a voltage higher or lower than 5% of nominal. One voltage range allowed in the US is specified by the American National Standards Institute (ANSI) as 120 volts nominal, 114 volts minimum and 126 volts maximum (120 V ± 5%).

CVR can be accomplished through a variety of well-known technologies including tap-changing transformers, line-drop compensators, voltage regulators, switchable capacitor banks and static VAR compensators (SVCs). SVCs are flexible AC transmission system (FACTS) devices that regulate the voltage on high voltage electrical transmission networks by absorbing or supplying reactive power. The advantage of using SVCs over other mechanism is their faster compensation operation and lack of mechanical switching compared to others. Figure 1(a) shows the SVC with a fixed capacitor (FC) and a controlled reactor (CR). Reactive power is continuously varied by controlling the current through the reactor via a bidirectional switch. This topology provides a partial control for regulating voltages. A more flexible solution is to have a bank of small shunt capacitors in conjunction with a controlled reactor. Each capacitor is controlled individually via a

bidirectional switch as shown in Figure 1(b). The operation behavior of a bank with multiple small capacitors has been shown to be superior to that of one large capacitor under large system disturbances². Moreover, the rating of the reactor is kept relatively smaller (nearly 1/n of the maximum output where n is the number of capacitor banks).



SCOPE

Task 1: Prototype Design

A preliminary task is to design a prototype of an RSVC based on end-user needs, marketing requirements, budget, and safety constraints. The design aims to be scalable to different distribution feeders with varying loads. The technical challenges lie in sizing the reactive components, control schemes, monitoring points, sensor technologies and triggering mechanism for SVCs. An encouraging development during this phase was to come up with an advanced high frequency PWM based triggering mechanism for SVCs instead of a classical thyristor-based switching³. This technique looks more promising for the implementation of single-phase SVCs because of lower harmonics generation.

Task 2: Prototype Simulation

This task includes simulating the RSVC prototype using a suitable software package (EPRI's OpenDSS) with realistic components and controls. Prototype simulations will be performed for a standard 24-kVA pole mounted distribution transformer serving typically three residential homes.

Task 3: Prototype Testing

Success of these simulations on small-scale distribution system will be measured by the following two criteria:

- i) Voltage Regulation (226V to 240V).
- ii) A cost-benefit analysis showing a payback period of three to five years.

Task 4: Hardware Design (Phase-II)

Initial results of phase-I research indicates that a (single-phase) RSVC offers a significant potential for energy savings by voltage regulation and it can become a valuable tool in a utility's demand-side management for energy efficiency, especially during peak demand hours. The next phase will be to implement and test a microprocessor-based prototype RSVC during peak demand.

DELIVERABLES

The deliverables for this project (Phase-I) will be a prototype design with results of the testing and a cost-benefit analysis of the payback period based on the pilot study.

PROJECT TEAM

PRINCIPAL INVESTIGATOR	
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BUDGET

TASK	BUDGET ALLOCATED
Prototype Design	\$12,000
Prototype Simulation	\$20,000
Interim Report	\$2,000
Prototype Testing	\$18,000
Final Report	\$8,000
Gross Total	\$60,000

SCHEDULE

TASK	TIME ALLOCATED	START DATE	END DATE
Prototype Design	2 months	Nov'14	Dec'14
Prototype Simulation	4 months	Jan'15	Apr'15
Interim Report	1 month	Feb'15	
Prototype Testing	2 months	May'15	Jun'15
Final Report	2 months	Jul'15	Aug'15

¹ J.G. De Steese, et al., "Estimating methodology for a large regional application of conservation voltage reduction," IEEE Transactions on Power Systems (Volume 5, Issue 3), September 1990.

² L. Gyugi and E. Taylor, "Characteristics of static thyristor-controlled shunt compensators for power transmission system applications," IEEE Trans. Power App. Syst., vol. PAS-99, pp. 1795-1804, Sept /Oct, 1980.

³ H. Jin, G. Goos and L. Lopes, "An efficient switched-reactor-based static var compensator," IEEE Trans. Ind. Appl., vol. 30, no. 4, pp. 998-1005, 1994.