

Attachment A WORK STATEMENT

TECHNICAL TASK LIST

Task #	CPR	Task Name
1	N/A	ADMINISTRATION
2		SMART METERS
3		CONSUMER BEHAVIOR STUDY
4		DEMAND RESPONSE
5		CUSTOMER APPLICATIONS
6	X	DISTRIBUTION AUTOMATION
7		SMART GRID TECHNOLOGY INFRASTRUCTURE
8		CYBERSECURITY

KEY NAME LIST

Task #	Key Personnel	Key Subcontractor(s)	Key Partner(s)
1	Kevin Hudson-SMUD	TBD	N/A
2	Vicky Zavattero - SMUD	L&G, Silver Springs Network	N/A
3-4	Vicky Zavattero - SMUD	TBD	N/A
5	Vicky Zavattero - SMUD	TBD	Dept of General Services; Sacramento County; CSUS; Los Rios CCD
6-8	Vicky Zavattero - SMUD	TBD	N/A

GLOSSARY

Specific terms and acronyms used throughout this scope of work are defined as follows:

Term/ Acronym	Definition
AMI	Advanced Metering Infrastructure
CPR	Critical Project Review
CSUS	California State University Sacramento
DOE	United States Department of Energy
Energy Commission	California Energy Commission
kV	Kilovolt
MVA	Mega Volt Amperage
PAC	Project Advisory Committee
PIER	Public Interest Energy Research
RD&D	Research, Development and Demonstration

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Term/ Acronym	Definition
SCADA	Supervisory Control and Data Acquisition
SMUD	Sacramento Municipal Utility District
VAR	Voltage Reactive Ampere

Problem Statement:

Sacramento Municipal Utility District's (SMUD) distribution system is currently comprised of 221 distribution transformers serving approximately 592,000 customers. The primary distribution system voltages include 21 kilovolt (kV) and 12kV. The 12kV system represents the majority of SMUD's distribution system and is served from a 69kV sub-transmission system running throughout the service territory. The 21kV system is comprised of five 115kV/21kV substations, with 32 feeders serving the downtown Sacramento region. The 12kV downtown network system is served from two 115kV/12kV substations.

Currently at the substations where Supervisory Control and Data Acquisition (SCADA) is unavailable, only monthly load readings are taken by field personnel. This creates a situation where system engineers and operators must make system assumptions based on non-coincident and insufficient load data. In addition, equipment temperature, power flow information, and coincident feeder data are unavailable for analysis. SCADA will enable collection of circuit load data, voltage levels, volt ampere reactive (VAR) flow, and transformer loading through the service territory. Once these data are available from a SCADA retrofit, SMUD system engineers will be able to more fully and effectively utilize system capacity and resources. Substation SCADA retrofits coupled with other integral smart grid tasks are expected to reduce outage cost, lower distribution losses, lower electricity use, and reduce greenhouse gas emissions.

SMUD's current distribution automation plan is to install SCADA at all of its 12kV distribution substations. Presently, SMUD has installed SCADA at all of the five 115kV/21kV substations and half of its 69kV/12kV unit substations. As part of the smart grid project, SMUD will install SCADA functionality at thirty-six (36) 69kV/12kV distribution substation sites where service capacity is at least 20 mega volt amperage (MVA).

The overall project will expand and accelerate the deployment of advanced smart grid technologies throughout the Sacramento region. When complete, SmartSacramento will: link smart meters and home area networks with upstream, automated distribution operations; optimize distribution system operations to improve system reliability and efficiency; and fully enable customers to participate in the electricity marketplace with the introduction of dynamic pricing and demand response programs. SCADA retrofit is vital for attaining all of the program goals and objectives. While SCADA may be installed in other areas, it has not been widely studied in combination with such a wide variety of other smart grid implementation projects.

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Goals of the Agreement:

The primary goal of this Agreement is to automate four (4) of the larger (at least 20 MVA capacity) 69kV/12kV distribution substations and associated equipment. Of the existing 136 distribution transformers meeting the criteria, 100 are candidates to be monitored and controlled by SCADA. This Agreement will provide funding toward Task 6, which involves four (4) substation automation projects, and will result in a report quantifying the results and successes of the installations. Furthermore, the Agreement will provide a nexus for sharing information on the overall SmartSacramento project that is reported to the U.S. Department of Energy (DOE). DOE is providing funding for the project under the American Recovery and Reinvestment Act of 2009.

Objectives of the Agreement:

The primary objective of this Agreement is to enable SCADA data collection on voltage levels, current demand, MVA, VAR flow, equipment state, operational state, etc. System operators will be enabled to use this information for capacitor control, breaker and switch operation, load transfers, line clearances, and system reporting functionalities. Once all the targeted distribution substations are automated, smart grid software will use this information along with SCADA data points throughout the distribution system to analyze and recommend re-configuration of the distribution system.

The circuit optimization will minimize line losses and integrate with customer data from Advanced Metering Infrastructure (AMI) in order to regulate voltage while still maintaining acceptable levels for customers. This functionality will be paramount to SMUD's efforts to implement a conservation voltage reduction (CVR) strategy. Accurate voltage data from end of line customers in conjunction with SCADA information at distribution substations will result in energy savings, reduced greenhouse gas emissions, and reduced outage costs if widely applied throughout SMUD's system. These savings, efficiencies and data can be objectively measured and reported.

Product Guidelines:

For complete product guidelines, refer to Section 5 in the Terms and Conditions.

TASK 1 ADMINISTRATION

Task 1.1 Attend Kick-off Meeting

The goal of this task is to establish the lines of communication and procedures for implementing this Agreement.

The Recipient shall:

- Attend a "Kick-Off" meeting with the California Energy Commission (Energy Commission) Project Manager, the Grants Officer, and a representative of the Accounting Office. The Recipient shall bring its Project Manager, Agreement Administrator, Accounting Officer, and others designated by the Energy Commission Project Manager to this meeting.

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The administrative and technical aspects of this Agreement will be discussed at the meeting. Prior to the kick-off meeting, the Energy Commission Project Manager will provide an agenda to all potential meeting participants.

The administrative portion of the meeting shall include, but not be limited to, the following:

- Discussion of the terms and conditions of the Agreement
- Discussion of Critical Project Review (Task 1.2)
- Match fund documentation (Task 1.6)
- Permit documentation (Task 1.7)

The technical portion of the meeting shall include, but not be limited to, the following:

- The Energy Commission Project Manager's expectations for accomplishing tasks described in the Scope of Work
- An updated Schedule of Products
- Discussion of Progress Reports (Task 1.4)
- Discussion of Technical Products (Product Guidelines located in Section 5 of the Terms and Conditions)
- Discussion of the Final Report (Task 1.5)

The Energy Commission Project Manager shall designate the date and location of this meeting.

Recipient Products:

- Updated Schedule of Products
- Updated List of Match Funds
- Updated List of Permits

Energy Commission Project Manager Product:

- Kick-Off Meeting Agenda

Task 1.2 Critical Project Review (CPR) Meetings

The goal of this task is to determine if the project should continue to receive Energy Commission funding to complete this Agreement and to identify any needed modifications to the tasks, products, schedule or budget.

CPRs provide the opportunity for frank discussions between the Energy Commission and the Recipient. CPRs generally take place at key, predetermined points in the Agreement, as determined by the Energy Commission Project Manager and as shown in the Technical Task List above. However, the Energy Commission Project Manager may schedule additional CPRs as necessary, and any additional costs will be borne by the Recipient.

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Participants include the Energy Commission Project Manager and the Recipient and may include the Energy Commission Grants Officer, the Public Interest Energy Research (PIER) Program Team Lead, other Energy Commission staff and Management as well as other individuals selected by the Energy Commission Project Manager to provide support to the Energy Commission.

If DOE is conducting similar meetings, the Recipient shall notify and invite the Energy Commission project manager to participate, either by teleconference or by actual meeting attendance. The DOE required meetings can be used in place of the Energy Commission's CPR meetings, at the discretion of the Energy Commission project manager.

The Energy Commission Project Manager shall:

- Determine the location, date, and time of each CPR meeting with the Recipient. These meetings generally take place at the Energy Commission, but they may take place at another location.
- Send the Recipient the agenda and a list of expected participants in advance of each CPR. If applicable, the agenda shall include a discussion on both match funding and permits.
- Conduct and make a record of each CPR meeting. One of the outcomes of this meeting will be a schedule for providing the written determination described below.
- Determine whether to continue the project, and if continuing, whether or not modifications are needed to the tasks, schedule, products, and/or budget for the remainder of the Agreement. Modifications to the Agreement may require a formal amendment (please see the Terms and Conditions). If the Energy Commission Project Manager concludes that satisfactory progress is not being made, this conclusion will be referred to the Energy Commission's Research, Development and Demonstration (RD&D) Policy Committee for its concurrence.
- Provide the Recipient with a written determination in accordance with the schedule. The written response may include a requirement for the Recipient to revise one or more product(s) that were included in the CPR.

The Recipient shall:

- Prepare a CPR Report for each CPR that discusses the progress of the Agreement toward achieving its goals and objectives. This report shall include recommendations and conclusions regarding continued work of the projects. This report shall be submitted along with any other products identified in this scope of work. The Recipient shall submit these documents to the Energy Commission Project Manager and any other designated reviewers at least 15 working days in advance of each CPR meeting.

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- Present the required information at each CPR meeting and participate in a discussion about the Agreement.
- Recipient will provide copies of any DOE correspondence (emails, reports, letters, etc.) that relate to the project status. This includes copies of project performance reviews on Recipient work and summaries and results of project review meetings with DOE.

Energy Commission Project Manager Products:

- Agenda and a list of expected participants
- Schedule for written determination
- Written determination

Recipient Product:

- CPR Report(s)
- DOE correspondence and reporting

Task 1.3 Final Meeting

The goal of this task is to closeout this Agreement. If DOE is conducting a similar final meeting, the Recipient shall notify and invite the Energy Commission project manager to participate, either by teleconference or by actual meeting attendance. The DOE required meeting can be used in place of the Energy Commission's final meeting, at the discretion of the Energy Commission Project Manager. However, all items listed in this task will need to be covered in the meeting.

The Recipient shall:

- Meet with Energy Commission staff to present the findings, conclusions, and recommendations. The final meeting must be completed during the closeout of this Agreement.

This meeting will be attended by, at a minimum, the Recipient, the Energy Commission Grants Office Officer, and the Energy Commission Project Manager. The technical and administrative aspects of Agreement closeout will be discussed at the meeting, which may be two separate meetings at the discretion of the Energy Commission Project Manager.

The technical portion of the meeting shall present an assessment of the degree to which project and task goals and objectives were achieved, findings, conclusions, recommended next steps (if any) for the Agreement, and recommendations for improvements. The Energy Commission Project Manager will determine the appropriate meeting participants.

The administrative portion of the meeting shall be a discussion with the Energy Commission Project Manager and the Grants Officer about the following Agreement closeout items:

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- What to do with any equipment purchased with Energy Commission funds (Options)
- Energy Commission's request for specific "generated" data (not already provided in Agreement products)
- Need to document Recipient's disclosure of "subject inventions" developed under the Agreement
- "Surviving" Agreement provisions, such as repayment provisions and confidential Products
- Final invoicing and release of retention
- Prepare a schedule for completing the closeout activities for this Agreement.
- Copies of all correspondence and reports discussing DOE's findings on the project, and future disposition of the project, if applicable. When directed by the Energy Commission project manager, recipient will provide copies of any DOE correspondence (emails, reports, letters, etc.) that relate to project performance.

Products:

- Written documentation of meeting agreements
- Schedule for completing closeout activities
- DOE correspondence on project findings and results

Task 1.4 Quarterly Progress Reports

The goal of this task is to periodically verify that satisfactory and continued progress is made towards achieving the research objectives of this Agreement on time and within budget.

The objectives of this task are to summarize activities performed during the reporting period, to identify activities planned for the next reporting period, to identify issues that may affect performance and expenditures, and to form the basis for determining whether invoices are consistent with work performed.

With Energy Commission project manager approval, the Recipient can submit a DOE Progress Report in lieu of the required Energy Commission report if it contains the information listed in Attachment 1 of the Terms and Conditions.

The Recipient shall:

- Prepare Quarterly Progress Reports which summarize all Agreement activities conducted by the Recipient for the reporting period, including an assessment of the ability to complete the Agreement within the current budget and any anticipated cost overruns. Each progress report is due to the Energy Commission Project Manager within 30 days of the end of the

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- Unless otherwise directed by the Energy Commission project manager, each Progress Report must contain any reports made to DOE, including summaries of meetings with DOE, as it relates to the project outcome and performance. Include names and contacts of DOE representatives.

Product:

- Quarterly Progress Reports
- Copies of DOE reporting and meeting summaries

Task 1.5 Final Report

The goal of the Final Report is to assess the project's success in achieving its goals and objectives, advancing science and technology, and providing energy-related and other benefits to California.

The final report shall describe the following at a minimum: a) original purpose, approach, activities performed, results and conclusions of the work done under this Agreement; b) how the project advanced science and technology to the benefit of California's ratepayers and the barriers overcome; c) assessment of the success of the project as measured by the degree to which goals and objectives were achieved; d) how the project supported California's economic recovery in the near term and number of jobs created or sustained; e) how the project results will be used by California industry, markets and others; f) projected cost reduction impact and other benefits resulting from the project; g) discuss the project budget, including the total project cost and all the funding partners and their cost share; h) discuss how the Energy Commission funding was spent on the project, including any unique products and benefits; i) observations, conclusions and recommendations for further RD&D projects and improvements to the PIER project management process.

If a final report is required by DOE, the Recipient will include a copy of it along with the Energy Commission's final report requirements. In addition, the Recipient shall submit the draft final DOE report to the Energy Commission for review at the same time it submits it to DOE.

The Final Report shall be a public document. If the Recipient has obtained confidential status from the Energy Commission and will be preparing a confidential version of the Final Report as well, the Recipient shall perform the following activities for both the public and confidential versions of the Final Report.

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The Recipient shall:

- Provide a draft copy of the Final Report including a copy of the draft submitted to the U.S. DOE in response to the American Recovery and Reinvestment Act Funding Opportunity Notice for which an award was received. The Final Report must be completed on or before the end of the Agreement Term.
- Submit written correspondence from DOE regarding acceptance of the final report.

Products:

- Draft Final Report, including a copy of the draft report submitted to DOE
- Final Report, including a copy of the final report submitted to DOE
- Written correspondence from DOE regarding acceptance of final report

Task 1.6 Identify and Obtain Matching Funds

The goal of this task is to ensure that the match funds planned for this Agreement are obtained for and applied to this Agreement during the term of this Agreement.

The costs to obtain and document match fund commitments are not reimbursable through this Agreement. Although the PIER budget for this task will be zero dollars, the Recipient may utilize match funds for this task. Match funds shall be spent concurrently or in advance of PIER funds for each task during the term of this Agreement. Match funds must be identified in writing and the associated commitments obtained before the Recipient can incur any costs for which the Recipient will request reimbursement.

The Recipient shall:

- Prepare a letter documenting the match funding committed to this Agreement and submit it to the Energy Commission Project Manager at least 2 working days prior to the kick-off meeting. The letter needs to identify the following at a minimum:
 - Amount of each cash match fund, its source, including a contact name, address and telephone number and the task(s) to which the match funds will be applied.
 - Amount of each in-kind contribution, a description, documented market or book value, and its source, including a contact name, address and telephone number and the task(s) to which the match funds will be applied. If the in-kind contribution is equipment or other tangible or real property, the Recipient shall identify its owner and provide a contact name, address and telephone number, and the address where the property is located.
- Provide a copy of the letter of commitment from an authorized representative of each source of cash match funding or in-kind contributions that these funds or contributions have been secured.

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- Discuss match funds and the implications to the Agreement if they are reduced or not obtained as committed, at the kick-off meeting. If applicable, match funds will be included as a line item in the progress reports and will be a topic at CPR meetings.
- Provide the appropriate information to the Energy Commission Project Manager if during the course of the Agreement additional match funds are received.
- Notify the Energy Commission Project Manager within 10 days if during the course of the Agreement existing match funds are reduced. Reduction in match funds must be approved through a formal amendment to the Agreement and may trigger an additional CPR.

Products:

- A letter regarding match funds
- Copy(ies) of each match fund commitment letter(s)
- Letter(s) for new match funds (if applicable)
- Letter that match funds were reduced (if applicable)

Task 1.7 Identify and Obtain Required Permits

The goal of this task is to obtain all permits required for work completed under this Agreement in advance of the date they are needed to keep the Agreement schedule on track.

Permit costs and the expenses associated with obtaining permits are not reimbursable under this Agreement. Although the PIER budget for this task will be zero dollars, the Recipient shall budget match funds for any expected expenditures associated with obtaining permits. Permits must be identified in writing and obtained before the Recipient can make any expenditures for which a permit is required.

The Recipient shall:

- Prepare a letter documenting the permits required to conduct this Agreement and submit it to the Energy Commission Project Manager at least 2 working days prior to the kick-off meeting. If there are no permits required at the start of this Agreement, then state such in the letter. If it is known at the beginning of the Agreement that permits will be required during the course of the Agreement, provide in the letter:
 - A list of the permits that identifies the:
 - Type of permit
 - Name, address and telephone number of the permitting jurisdictions
 - or lead agencies
 - The schedule the Recipient will follow in applying for and obtaining these permits.

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- Discuss the list of permits and the schedule for obtaining them at the kick-off meeting and develop a timetable for submitting the updated list, schedule and the copies of the permits. The implications to the Agreement if the permits are not obtained in a timely fashion or are denied will also be discussed. If applicable, permits will be included as a line item in the Progress Reports and will be a topic at CPR meetings.
- If during the course of the Agreement additional permits become necessary, provide the appropriate information on each permit and an updated schedule to the Energy Commission Project Manager.
- As permits are obtained, send a copy of each approved permit to the Energy Commission Project Manager.
- If during the course of the Agreement permits are not obtained on time or are denied, notify the Energy Commission Project Manager within 5 working days. Either of these events may trigger an additional CPR.

Products:

- Letter documenting the permits or stating that no permits are required
- A copy of each approved permit (if applicable)
- Updated list of permits as they change during the term of the Agreement (if applicable)
- Updated schedule for acquiring permits as changes occur during the term of the Agreement (if applicable)

TECHNICAL TASKS

Unless otherwise provided in the individual Task, the Recipient shall prepare all products in accordance with the requirement in the Special Conditions.

The Energy Commission is partially funding Task 6. The Recipient and DOE are funding Tasks 2 through 8.

TASK 2 SMART METERS

The goal of this task is to install 615,000 smart meters and a communication network.

The Recipient Shall:

- Install approximately 615,000 smart meters
- Install communication network
- Prepare monthly project status reports
- Prepare quarterly metrics reports

Products:

- Monthly project status reports (no draft)
- Quarterly metrics reports (no draft)

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TASK 3 CONSUMER BEHAVIOR STUDY

The goal of this task is to study the behavior of consumers in their response with respect to dynamic pricing of electricity utilizing randomized control and treatment groups.

The Recipient Shall:

- Develop a consumer behavior study plan
- Implement a consumer behavior study
- Prepare monthly project status reports
- Prepare quarterly metrics reports
- Prepare a draft consumer behavior study report
- Prepare a final consumer behavior study report

Products:

- Monthly project status reports (no draft)
- Quarterly metrics reports (no draft)
- Consumer behavior study plan (no draft)
- Draft consumer behavior study report
- Final consumer behavior study report

TASK 4 DEMAND RESPONSE

The goal of this task is to install demand response management system software and demand response devices at customer locations in order to manage load.

The Recipient Shall:

- Purchase and install up to 10,000 Home Area Network devices
- Develop an Automatic Demand Response program for commercial customers
- Install technologies that will enable residential and commercial customers to leverage smart meter data to manage and control their energy use.
- Prepare monthly project status reports
- Prepare quarterly metrics reports

Products:

- Monthly project status reports (no draft)
- Quarterly metrics reports (no draft)

TASK 5 CUSTOMER APPLICATIONS

The goal of this task is to work with partners to install energy management control systems and electric vehicle charging stations. A second goal is to develop a communications roadmap and systematic method for engaging the customer on benefits and use of smart grid tools. A third goal is to set up a pilot project and install up to 180 residential electric vehicle charging stations.

The Recipient Shall:

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- Install energy management control systems at partner locations
- Install electric vehicle charging stations at selected partner locations
- Develop a communications roadmap and rollout the program
- Install electric vehicle charging stations at residential locations
- Prepare monthly project status reports
- Prepare quarterly metrics reports

Products:

- Monthly project status reports (no draft)
- Quarterly metrics reports (no draft)

TASK 6 DISTRIBUTION AUTOMATION

The goal of this task is to update and automate SMUD’s electrical distribution system, as part of SMUD’s SmartSacramento project. The project will improve efficiency and reliability, focusing on 4 substations.

Retrofit Schedule

The retrofit work at each substation will be completed in two phases. Phase 1 work consists of civil/telecom design and construction including some pre-electrical work that can be performed without taking the substation clearance. Phase 2 work involves replacement of old electromechanical relays and associated wiring with new Intelligent Electronic Devices (IED) devices and wiring. The schedule of work is as below:

Substation Name	<u>Phase 1</u>		<u>Phase 2</u>	
	Start	Complete	Start	Complete
Mather #1	Q2 2011	Q2 2012	Q2 2012	Q3 2012
Walerga Galbrath #1	Q2 2011	Q2 2012	Q2 2012	Q3 2012
Whiterock Sunrise #1	Q2 2011	Q2 2012	Q3 2012	Q4 2012
Mather #2	Q2 2011	Q3 2012	Q3 2012	Q4 2012

The Recipient Shall:

- Retrofit approximately four (4) existing 69kV/12kV substations with Supervisory Control and Data Acquisition (SCADA) capabilities by installing Intelligent Electronic Devices for remote operation and control.
- Collect real-time system status (voltage, current, real and reactive power, equipment operational state, and events logging)
- Enable remote control of capacitor banks, breakers and voltage regulators
- Monitor critical substation assets and improved asset management by analyzing operational data and gaining a better understanding of equipment operation
- Improve fault analysis and service restoration by automatically retrieving events files for analysis

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- Prepare monthly project status reports
- Prepare quarterly metrics reports
- Prepare a draft Distribution Automation Report detailing the activities listed above and the results of the activities. Submit the report to the Energy Commission Project Manager for review and comments
- Finalize the Distribution Automation report by incorporating and addressing the Energy Commission Project Manager's comments on the draft report. Submit the Final Report to the Energy Commission
- Participate in a CPR as per Task 1.2

Products:

- Monthly project status reports (no draft)
- Quarterly metrics reports (no draft)
- Draft Distribution Automation Report
- Final Distribution Automation Report

TASK 7 SMART GRID TECHNOLOGY INFRASTRUCTURE

The goal of this task is to install software and hardware that will enable SMUD's systems to communicate, and to install hardware and software modules to enable customer service representatives to communicate with the customer.

The Recipient Shall:

- Install Enterprise Service Bus
- Install Customer Relationship Manager module
- Prepare monthly project status reports
- Prepare quarterly metrics reports

Products:

- Monthly project status reports (no draft)
- Quarterly metrics reports (no draft)

TASK 8 CYBERSECURITY

The goal of this task is to incorporate cyber security in all aspects of the SmartSacramento project, manage vulnerability, and identify and install suitable countermeasures to protect privacy and ensure security of information.

The Recipient Shall:

- Identify technical requirements for each task to mitigate cyber threats and vulnerabilities
- Install hardware and software necessary to mitigate threats and vulnerabilities
- Prepare monthly project status reports
- Prepare quarterly metrics reports

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Products:

- Monthly project status reports (no draft)
- Quarterly metrics reports (no draft)