Smart Grid Demonstration Project Completion Report

City Council

October 21, 2013

Report Outline

- Agenda Report Errata
- Project Background
- Solar Summary
- Wind Turbine, Meteorology, SCADA, Fiber Optics, Electrical Facilities Summary
- Cost Summary
- Successes & Lessons Learned
- Staff Findings & Recommendations

Agenda Report Errata

- Page 2, item 9, total cost correction:
  - Incorrect ~~$416,215.82~~
  - Correct $\underline{\$429,462.99}$
  - $13,247.17 final invoice not previously included
- Page 2, item 12 component
  - Incorrect ~~Phase IV~~ Concentrating Photovoltaics
  - Correct $\underline{\text{Phase V}}$ Concentrating Photovoltaics
- Page 2, Totals:
  - Incorrect ~~$1,467,750.56~~
  - Correct $\underline{\$1,480,997.73}$
  - $13,247.17 final invoice not previously included

AGENDA REPORT

DATE: October 21, 2013

TO: City Council

THRU: Ted Barkley, City Manager

FROM: Larry Dunbar, Director of Energy Services

RE: **Smart Grid Demonstration Project Completion Report**

SUMMARY: Staff will present the City's Smart Grid Demonstration Project (SGDP) completion report at tonight's meeting. Staff recommends the thin film solar photovoltaic installation, solar radiation energy metering, fencing, and project reporting be continued through the 1/31/2015 grant term.

BACKGROUND: On 6/21/2010, City Council approved Sub-Recipient Cooperative Agreement No. 118433 with the Battelle Memorial Institute (grantor) for a $597,908 grant for participation in the SGDP through the Unites States Department of Energy. The purpose of the project was to verify smart grid technology viability, quantify costs and benefits, and validate new smart grid business models, at a scale that can be readily adapted and replicated around the country.

There were 3 modifications to the agreement that have been approved by City Council. Modification 1, which was approved by City Council on 11/1/2010, increased the ceiling amount by $4,000. Modification 2, which was approved by City Council on 11/21/2011, increased the ceiling amount by another $151,101. Modification 3, which was approved by City Council on 2/19/2013, increased the ceiling amount by another $87,260 for a total grant of up to $840,269.

ANALYSIS/FINDINGS: As shown on the following page, as of 10/15/2013 the actual total cost of the SGDP was $1,467,750.56 and the actual total grant received by the City was $795,936.91 (out of the $840,269 available grant). Staff recommends that components 1-5 of the SGDP be accepted as complete and be continued through the 1/31/2015 grant term, component 6 be accepted as complete and discontinued, components 7-9 be accepted as complete and removed, and components 10-12 that are not completed be discontinued. After receiving instructions from the grantor, staff will return to City Council to request disposition of removed components 7-9.

RECOMMENDATION: That City Council: A) accept as complete and continue through the grant term components 1-5 of the SGDP; accept as complete and discontinue further work on component 6 of the SGDP; accept as complete, discontinue further work, and authorize removal components 7-9 of the SGDP; and discontinue further work on components 10-12 of the SGDP, all as shown on the following page, B) authorize the Director of Energy Services to negotiate and approve modifications to Cooperative Agreement No. 118433 as necessary; C) authorize the Director of Energy Services to end the agreement with Burke Electric, approve an amendment to accept the work as is, and authorize final payment in an amount not to exceed $19,882.50; D) authorize the Director of Energy Services to end the agreement with Central Washington University and authorize final payment of $34,376.59; E) authorize the Director of Energy Services to proceed with tower removal, which may involve a combination of a contractor and light utility staff to perform the work; and F) as a continuing commitment to City Council's renewable energy goals authorize the Director of Energy Services to proceed with an evaluation of commercially available solar photovoltaic panels through the Western Public Agencies Group, in an amount not to exceed $5,000.

SGDP summary including change orders through 10/15/2013

Component	Contractor	Status	Total Cost
1. SCADA System[1]	RAI	Complete Continue	$151,736.81
2. Fiber Optics	Potelco	Complete Continue	98,091.36
3. High & Low Voltage Installation	Pipkin Potelco Light crew	Complete Continue	210,167.82
4. Phase IV Thin Film Photovoltaics	Solar City	Complete Continue	291,787.00
5. Fencing[2]	M2 Yakima Fence	Accept as complete Continue	59,404.44
6. Data Analysis[3]	CWU	Accept as complete Discontinue	34,376.59
7. Climate Data Equipment	Light crew	Complete Remove (except continue solar radiation energy metering)	29,620.72
8. Wind Turbine (1 unit)[3]	Hire Electric	Complete Remove	96,350.00
9. Wind Turbines (8 units)[3]	Burke	Accept as complete Remove	416,215.82
10. Signage	*No award*	Incomplete Discontinue	-
11. Landscaping	*No award*	Incomplete Discontinue	-
12. Phase IV Concentrating Photovoltaics[4]	Infinia	Incomplete Discontinue Seek recovery of prepayment	80,000.00
		Totals	$1,467,750.56

[1]SCADA System means Supervisory Control and Data Acquisition System.
[2]The fencing to be continued surrounds the base of existing towers, the temporary fencing surrounding the failed tower will be removed.
[3]Sufficient funds to support the expenses are available within the light fund operating cash balance.
[4]Infinia Corporation filed a voluntary petition for Chapter 11 relief on September 17, 2013.

Background

Events leading up to Smart Grid Demonstration

- 2001 West Coast Energy Crisis
- **MAJOR** wholesale power cost increases
- 2006 Community Solar Project began
- 2006 Initiative 937 & Renewable Portfolio Standards
- 2008 Regional Dialogue Power Sales Agreement
  - Growth costs no longer regionalized
- 2008 Growth
- New Tiered Rate Methodology
  - Energy growth costs at margin for City
  - Peak demand rates set to stimulate investment

Background - Continued

Events after beginning Smart Grid Demonstration

- The Great Recession
- Tier 1 wholesale power supply adequate
- Tier 2 wholesale power impacts begin 10/1/2014
- Abundant natural gas supplies
- Change

Background - Continued

SGDP Grant Purposes

- Verify smart grid technology, viability, quantify costs and benefits
- Validate new business models, at a scale that can be readily adapted and replicated around the country

Demonstration Project

- Demonstration: To prove or show by evidence or reasoning. To show or reveal.
- Project: A particular plan or intention. A planned or contemplated venture. *Has a beginning and an end.*

Background – Continued

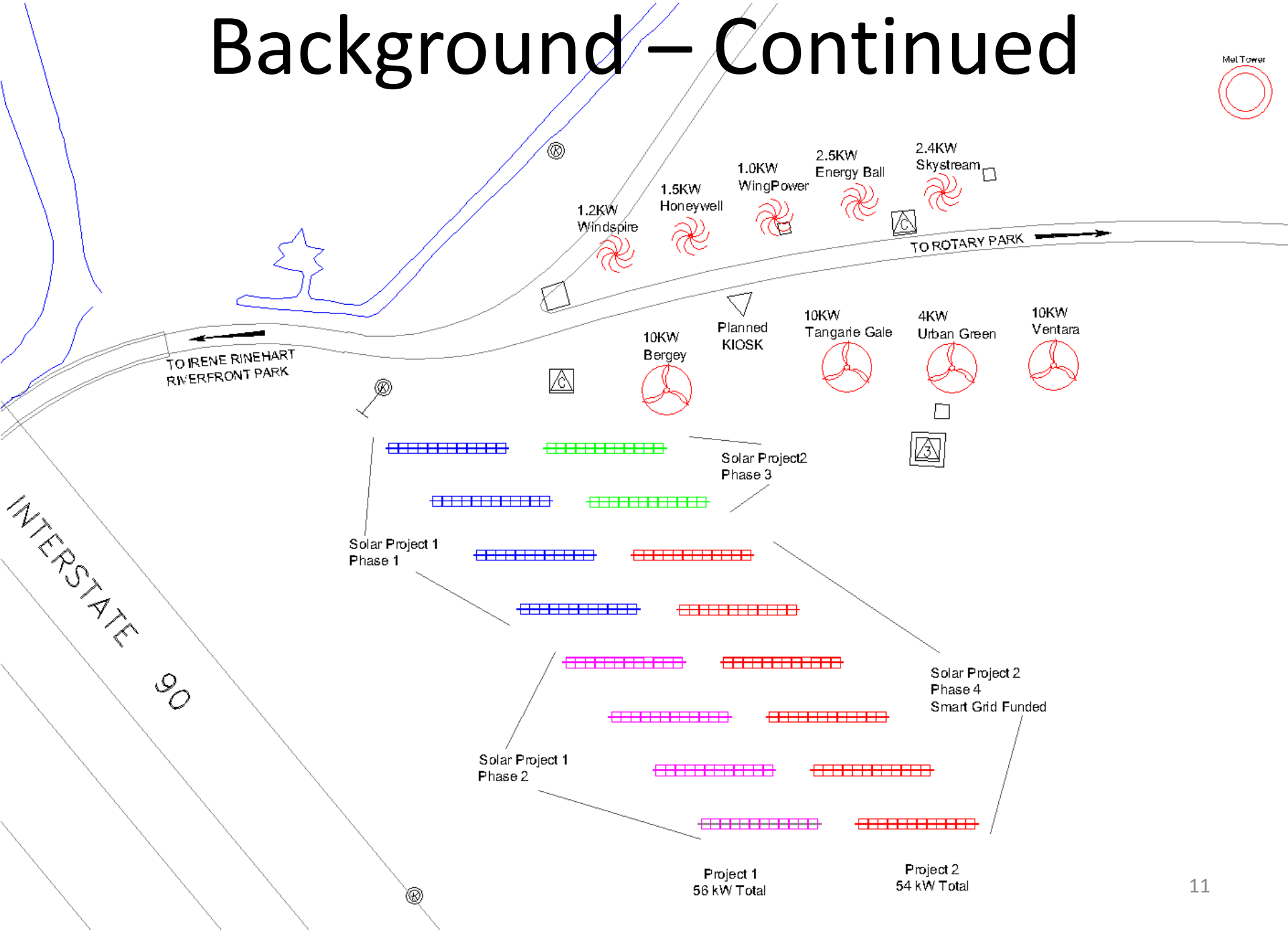
Grant Financial Summary		
Description	Explanation	Amount
Cooperative Agreement (7/1/2010)	Initial Grant	$597,908
Modification 1 (11/1/2010)	to allow expense of $601,908 grant award	4,000
Modification 2 (11/21/2011)	for 3 phase power, fiber optics, and increased SCADA and solar panel costs	151,101
Modification 3 (2/19/2013)	for increased cost of wind turbines and staff time	87,260
Total grant available & total City cost share		**$840,269**

Solar Summary (Phases I – V)

Project 1 - Phases I & II
BPA Grant & 67 Customer Contributions (CWU)
56 kW Standard Polycrystalline
46,512 kWh/year $3,025 retail value
Phase I completed 2006, Phase II completed 2008

Project 2 - Phases III, IV & V (Phase IV & V SGDP)
Phase III 22 Customer Contributions (KPUD, PSE, SCL)
54 kW Thin-Film Nano-Technology
Phase III completed 2009, **Phase IV** completed 2010 (SGDP)
52,600 kWh/year $3,420 retail value (Phase IV)
Phase V Concentrating Photovoltaics Incomplete (SGDP)

Background – Continued



SGDP Thin Film Solar Photovoltaic (Phases IV)

Operating Wind Turbine (5) Summary

Best performance from left to right

Bergey

Ventera

Skystream

Wing Power

Energy Ball

Inoperable Wind Turbine (4) Summary

Windspire

Windtronix

Urban Green

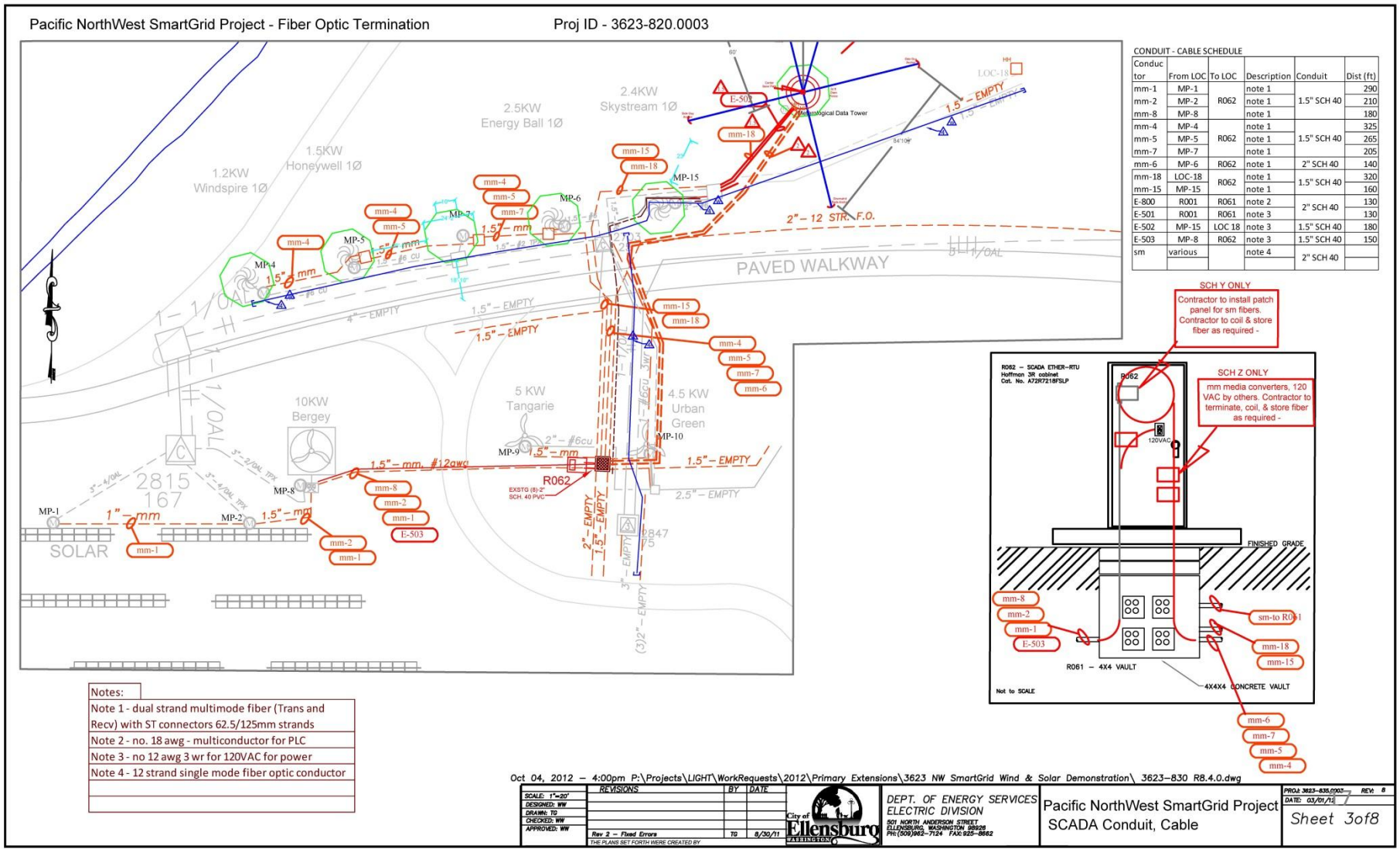
Tangarie

Wind Turbine Tangarie Tower Failure

Meteorological Tower

- Requires calibration & commissioning
- Failed humidity sensor

SCADA, Fiber Optics, Electrical Facilities



Cost Summary

Component	Total Cost
SCADA System	$151,736.81
Fiber Optics	98,091.36
High & Low Voltage Installation	210,167.82
Phase IV Thin Film Photovoltaics	291,787.00
Fencing	59,404.44
Data Analysis	34,376.59
Climate Data Equipment	29,620.72
Wind Turbines	525,812.99
Signage	-
Landscaping	-
Phase V Concentrating Photovoltaics	80,000.00
Total Cost	$1,480,997.73
Grant	$795,936.91

Preliminary Cost/Benefit Summary

Component	Projected & Actual Annual kWh Generation		Cost	[1]Average Cost per KWh
Phase IV Photovoltaic	**52,600**	**52,740**	**$291,787**	**$0.28/kWh**
Bergey		5,362	$96,350	$0.90/kWh
Ventura		5,285	$85,000	$0.80/kWh
Skystream		1,337	$24,770	$0.90/kWh
All Wind Turbines	**50,100**	**12,155**	**$525,812**	**$2.16/kWh**
SGDP	**102,700**	**64,895**	**$1,480,997**	**$1.14/kWh**
BPA Wholesale Power Cost – Tier 1/2			**$0.035/kWh &**	**$0.049/kWh**
City Retail Residential Rate				**$0.065/kWh**

Statistics on 6 wind turbines not presented due to lack of performance

[1]Assumes 20 year financing, 0% interest rate, no operation & maintenance or other continuing costs

Putting It Into Perspective

Component	Annual kWh Generation	Electric Utility Annual Sales kWh	Nameplate kW	Electric Utility Peak kW
Phase IV Photo-voltaics	52,740		40.5	
All Wind Turbines	50,100		44.6	
Total	102,840	202,069,636	85.1	38,914
Contribution		0.0005% (5/100 of 1%)		0.002% (2/10 of 1%)

Cost Summary – If Completed

Component	Total Cost	Completion Estimate
SCADA System	$151,736.81	$39,533.94
Fiber Optics	98,091.36	-
High & Low Voltage Installation	210,167.82	-
Phase IV Thin Film Photovoltaics	291,787.00	-
Fencing & trailway relocation	59,404.44	140,000.00
Data Analysis	34,376.59	37,623.41
Climate Data Equipment	29,620.72	10,000.00
Wind Turbines	525,812.99	Range 62,385.55 225,000.00
Signage	-	25,000.00
Landscaping	-	20,000.00
Phase V Concentrating Photovoltaics	80,000.00	200,000.00
Total Cost	$1,480,997.73	Range $534,542.90 $795,542.90

SGDP Successes

- Proactive approach to future energy resources
- 2012 Governor's smart community award
- Recognized as leaders in community renewables
- Good customer interest & support
- When the sun rises the photovoltaics generate electricity (even on a cloudy day)
- Photovoltaics have low maintenance needs

SGDP Lessons Learned (Prior Director)

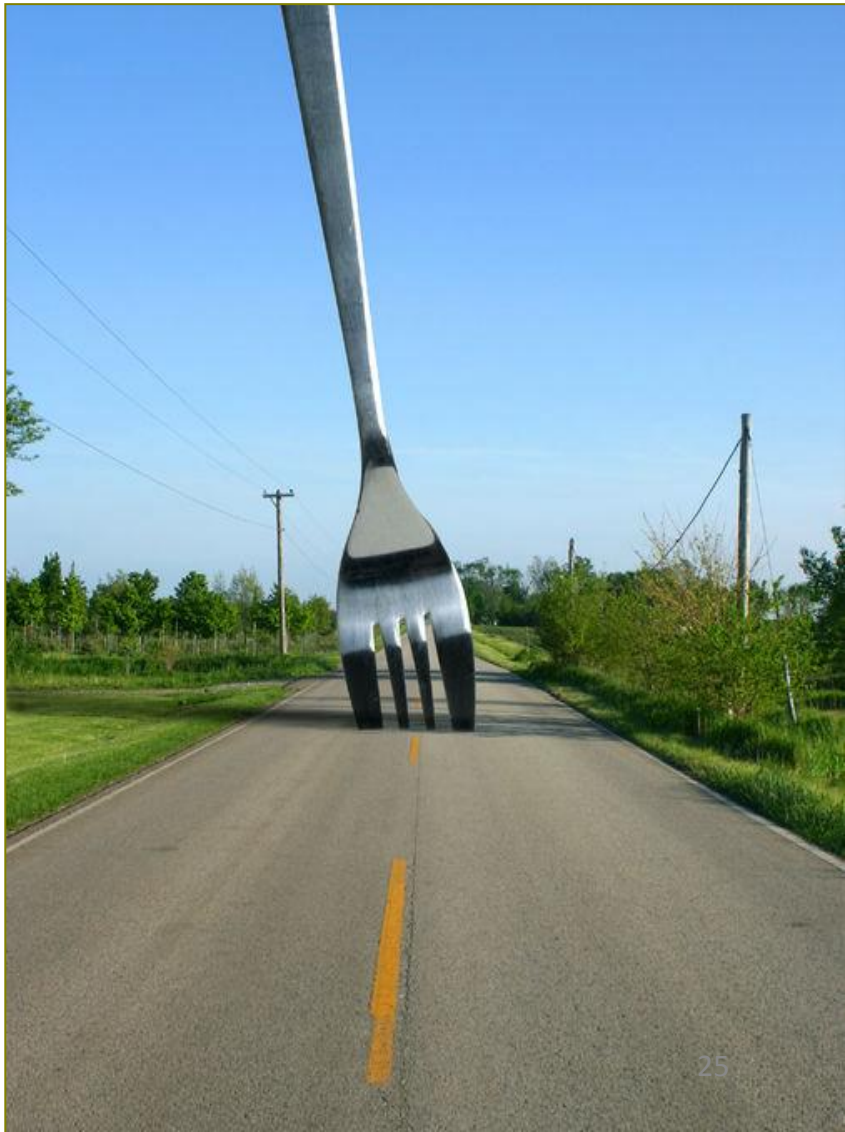
- Even signed contracts with pre-payments to vendors does not mean products will be delivered
- Lots of vendors only exist on the web
- Experimental software and control systems are ever evolving and end up costing more time and money
- Small wind turbines require frequent maintenance

Lessons Learned - Continued

- If the wind blows the wind turbines *may/may not* generate electricity
- Tower & turbine safety, efficiency, reliability
- Not all wind turbine technology is commercially ready
- Compliance with grant procurement rules
- Change happens
- Not immune to mice & vandalism

SGDP Staff Findings

1. Safety and risk management concerns
2. Estimated completion costs outweigh benefits
3. Ongoing operating & maintenance costs unknown & significant
4. We have learned a lot, now let's focus on what works best



Staff Recommendation - A

Accept as complete and continue through grant term:

1. SCADA System
2. Fiber Optics
3. High & Low Voltage Installation
4. Phase IV Thin Film Photovoltaic
5. Fencing @ Tower Base (remove temporary fencing that surrounds failed tower)

- *Photovoltaic credits to customers continue*
- *Reporting to grantor through 1/31/2015*

Staff Recommendation - A

Accept as complete and discontinue further work:

6. Data Analysis by Central Washington University

Accept as complete, discontinue further work, and authorize removal:

7. Climate Data System (except continue solar radiation energy metering)
8. Wind Turbine (1 unit)
9. Wind Turbines (8 units)

- *Grantor concurs with removal*
- *Reimbursement to grantor not required*

Staff Recommendation - A

Discontinue further work:

10. Signage

11. Landscaping

12. Phase V Concentrating Photovoltaics (seek recovery of prepayment)

Staff Recommendation – B-E

Authorize the Director of Energy Services to:

B. Negotiate and approve modifications to Cooperative Agreement as necessary

C. End the Agreement with Burke Electric, approve an agreement amendment to accept work as is, authorize final payment not to exceed $19,882.50

D. End the Agreement with Central Washington University and authorize $34,376.59 final payment

E. Proceed with Tower removal

Staff Recommendation – F

Authorize the Director of Energy Services to:

F. Proceed with an evaluation of leading commercially available solar photovoltaic panels through the Western Public Agencies Group

Proposed reuse of existing tower foundations for mounting photovoltaic panels

Questions?

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