

Creating a Business Case for Smart Grid Implementation

Smart Grid Initiatives for Utilities

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“A little revolution now and
then is a good thing.”

- *Thomas Jefferson, 1787*



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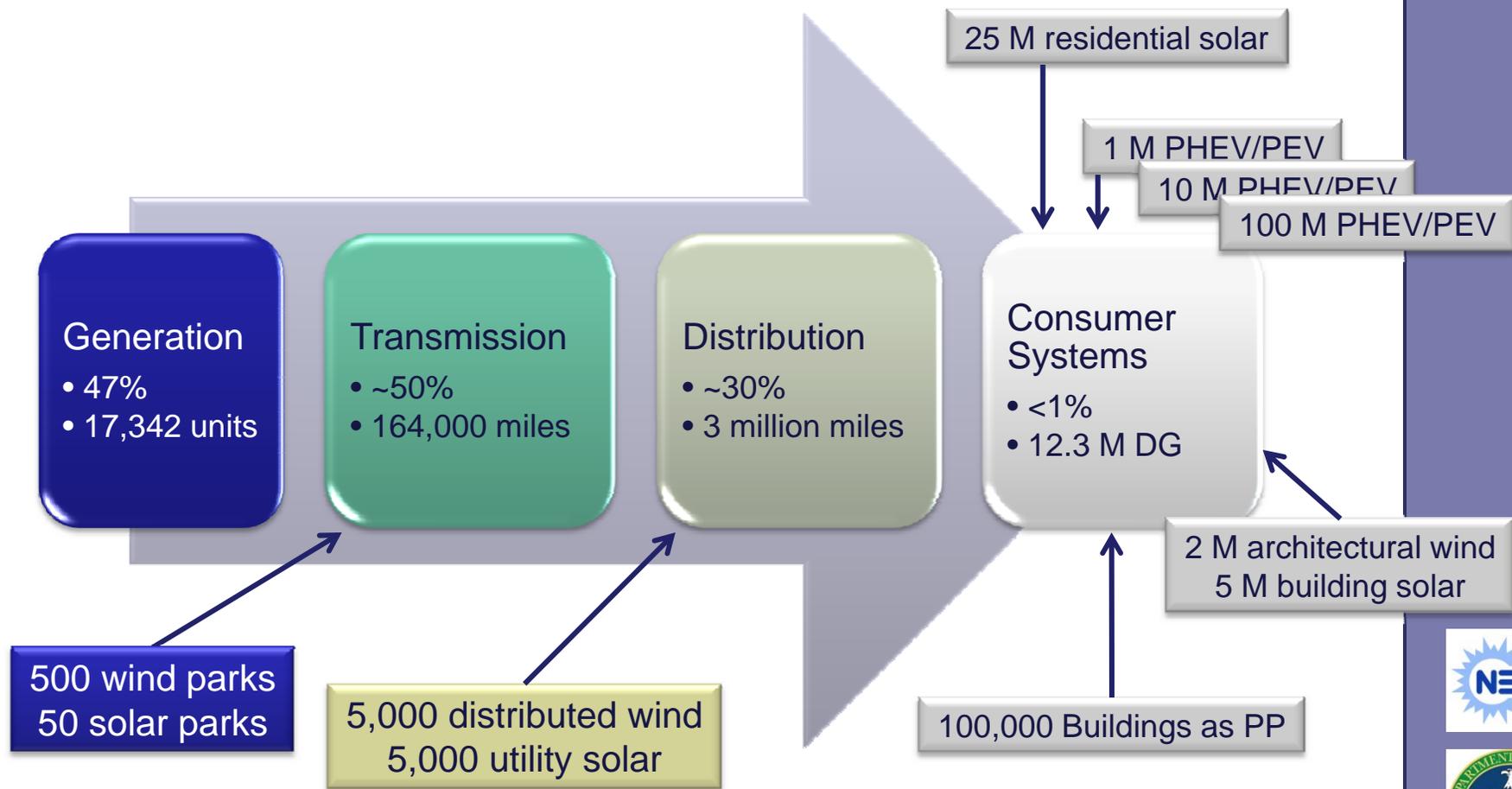
Revolution?

- **Consumers' interest is increasingly green and self-determining.**
- **Grid complexities are increasing.**
- **Political landscape is shifting, and the old electricity model is being questioned at its roots.**
- **While today's focus is on large wind plants, the massive change on the electric system is really happening with distributed renewables.**
- **This is the disruptive arena for the next 20 years - driven by consumers and the greening of America.**
- **This requires significant intelligence in the grid and a new regulatory model.**



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2009 Electric Grid and then?



Result – Sea Change in the Network

- **Consumer engagement with resources to solve power issues locally**
- **Two-way power flow in Distribution**
- **As prices increase, local renewables will increase in residential, commercial, and industrial**
- **Imperative to transform from passive to active control in Distribution**
- **New ways for Distribution to become a Transmission resource**

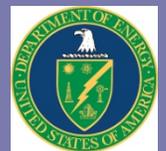


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The Smart Grid is “transactive” and will:

- *Enable* active participation by consumers
- *Accommodate* all generation and storage options
- *Enable* new products, services, and markets
- *Provide* power quality for the digital economy
- *Optimize* asset utilization and operate efficiently
- *Anticipate & respond* to system disturbances (self-heal)
- *Operate* resiliently against attack and natural disaster

...the enabler



If you come to a fork in the road,
take it.

- *Yogi Berra*

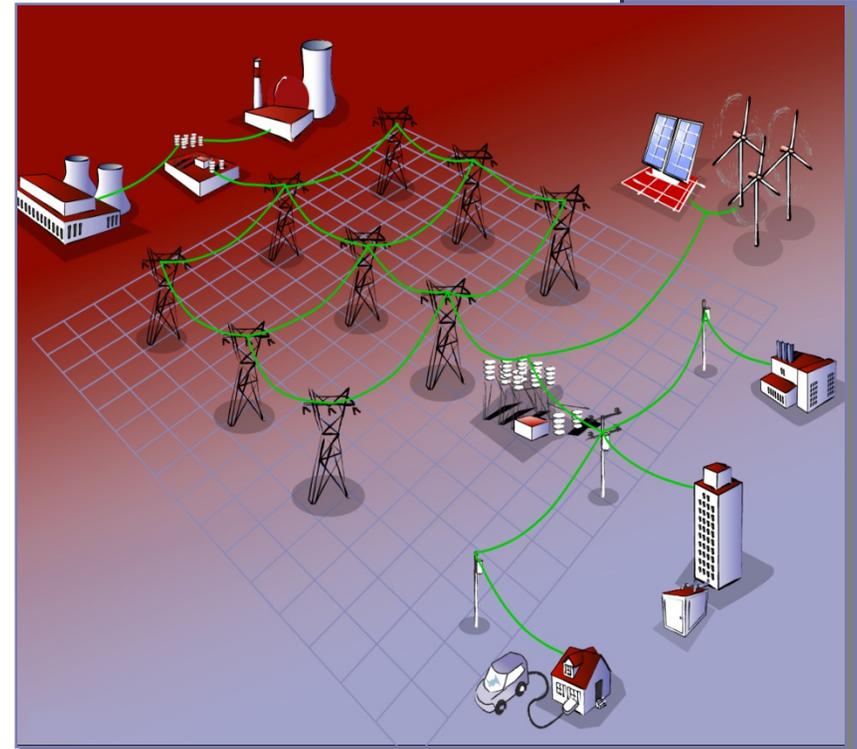
WEST VIRGINIA SMART GRID IMPLEMENTATION PLAN



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West Virginia Smart Grid Implementation Project

- **\$640K project jointly funded through Attachment H process by NETL, RDS, Allegheny Power, AEP, State of West Virginia, WVU, and DOE OE**
- **Results will describe approach and value proposition of implementing Smart Grid in West Virginia**
- **Cost & benefit analysis comparing the state of current electricity grid and future Smart Grid in West Virginia**
- **Address the role of coal in Smart Grid**
- **Support economic development in State of West Virginia**
- **Only state-wide Smart Grid implementation plan**
- **Establishes West Virginia and NETL as leader in Smart Grid**
- **Only second Smart Grid study to be published**



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West Virginia Smart Grid Solutions

MODERN GRID
STRATEGY

Solution	Scope
Advanced Meter Infrastructure (AMI) IT Integration (IT)	All residential, commercial, and industrial Customers represented by 998,317 meters A CIS Upgrade to accommodate AMI and DR functionality & Outage Management
Demand Response (DR)	The aggregated sum of 104 MW of DR from Residential, Commercial, and Industrial Customers
Distribution Management System (DMS)	The automated fault clearing & restoration of service, circuit monitoring, and control of the Distribution System to include 707 circuits of 1,107 total circuits
Distributed Energy Resources (DER)	100MW of Base Generation, 800 MW of Peak Generation, 250 MW of Advanced Storage and 100 MW of Wind Resources all capable of being dispatched on demand

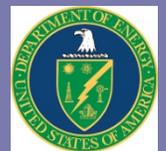


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WV Smart Grid Costs & Benefits

PV 20-yr Cost and Benefits (\$M)

Solution	Cost	Benefits
AMI	\$399	\$1,649
IT	\$170	\$1,308
DR	\$22	\$1,091
DMS	\$454	\$3,288
DER	\$832	\$5,289
Total	\$1,878	\$12,625

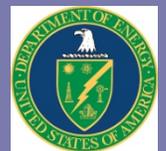


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WV Benefits by Beneficiary

PV 20-yr Benefits by Beneficiaries (\$M)

Solution	Consumer	Operational	WV Society	US Society
AMI	\$630	\$439	\$308	\$271
IT	\$563	\$136	\$326	\$283
DR	\$23	\$614	\$240	\$214
DMS	\$2,909	\$73	\$303	\$2
DER	\$3,368	\$2	\$301	\$1,618
Total	\$7,493	\$1,263	\$1,479	\$2,389



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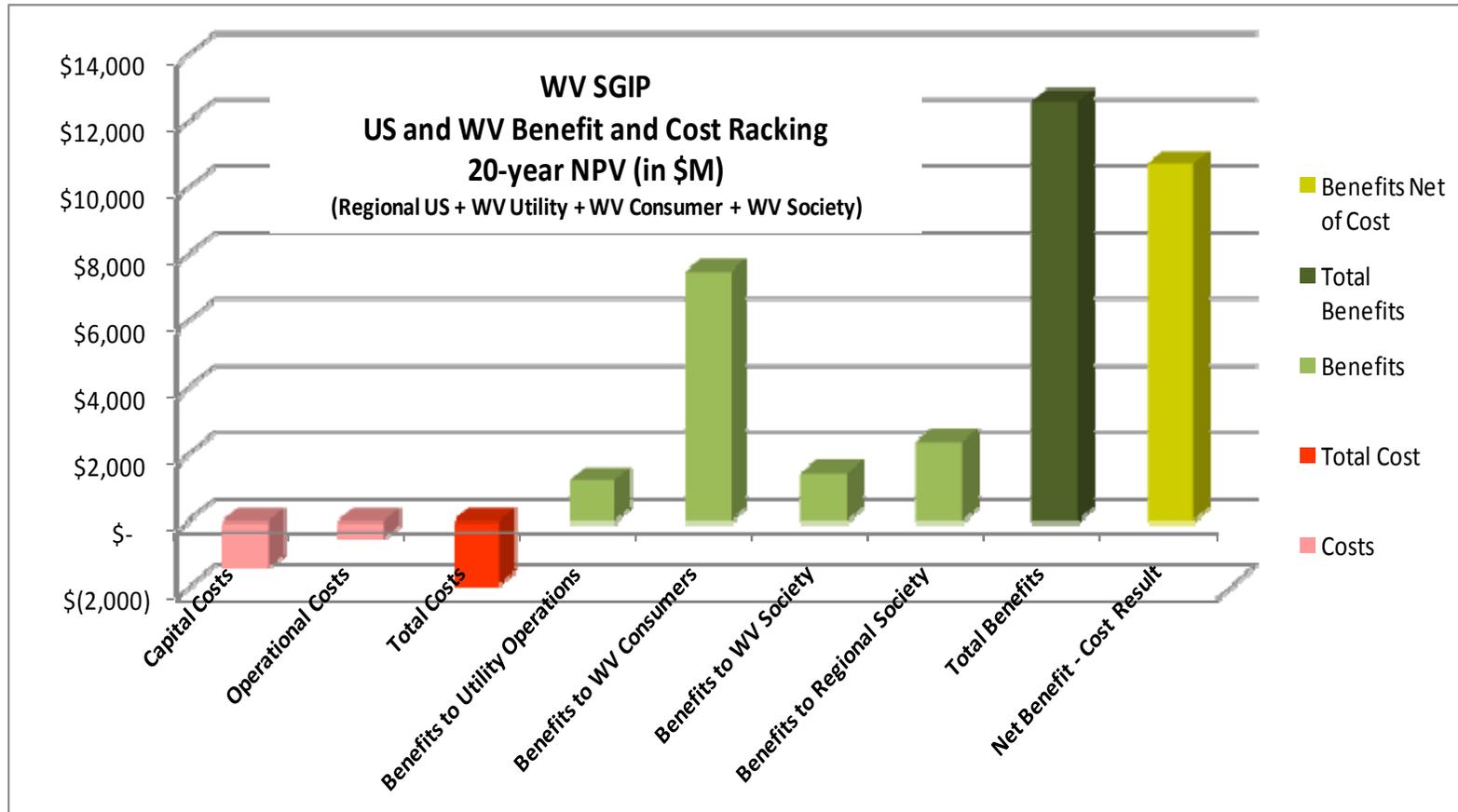
WV Annual Benefits (\$M)

Key Success Factors	Benefits	Annual Benefits (\$M) (All Beneficiaries)
Reliability	Reduced Consumer Losses	\$898
	Reduce Power Quality Events	\$131
Economic	Reduce Price of Electricity	\$399
	Job Creation	\$215
	Consumer Sales of DER Resources	\$175
	Increased Energy Sales as Exports	\$7
	Reduced Transmission Congestion	\$1
	Increased Transportation Fuels Business	\$5
	Consumer Conservation	\$20
Environmental	Operational Savings	\$194
	Reduced Emissions	\$7
Security	Reduced Blackout Probability & Dependence on Foreign Oil	\$13
Safety	Reduce Hazard Exposure	\$1



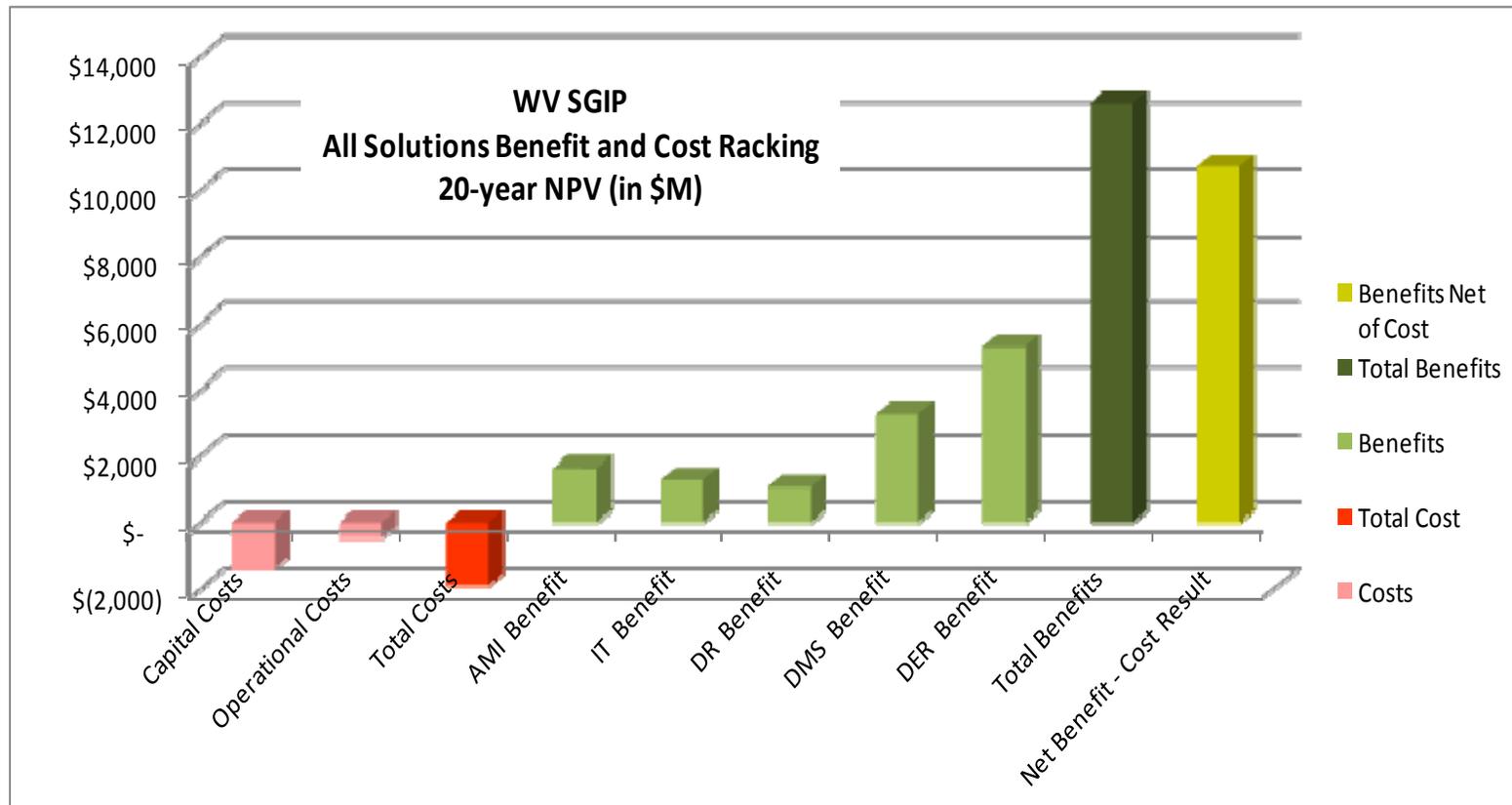
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Total Benefits & Cost Racking



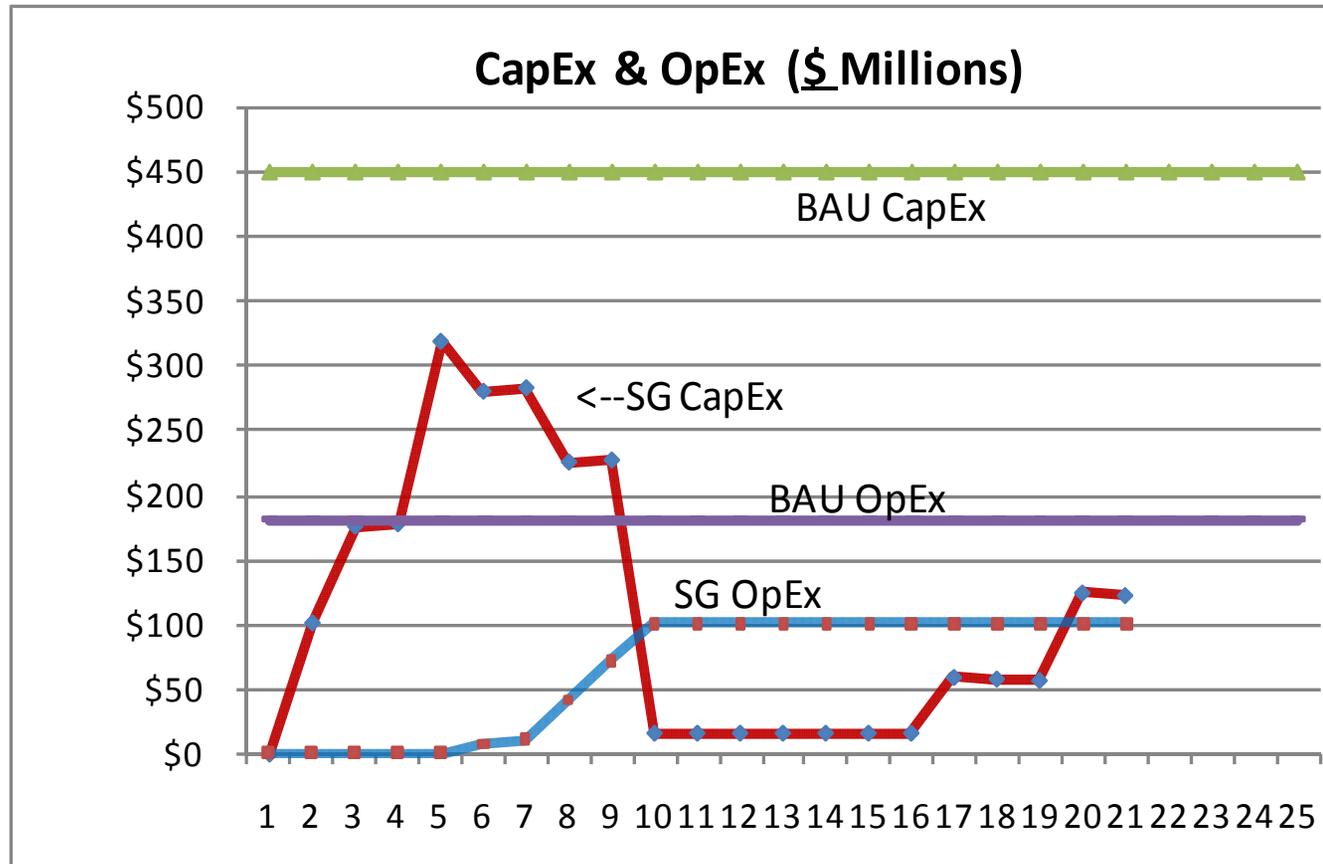
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Racking Costs & Benefits by Solution



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Comparing Business As Usual to the Smart Grid Plan



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- **Implementing a Smart Grid will:**
 - Radically improve system reliability
 - Lower the carbon footprint
 - Support a better sustainable business climate
 - Generate benefits beyond the borders

- **WV “numbers” (20-yr present value)**
 - ~ 1 million meters
 - Total Smart Grid Cost - ~ \$1.9B
 - Total Smart Grid Benefit - ~ \$10B
 - Benefit Cost Ratio: 5:1

- **A Smart Grid can be implemented with a portion of the business as usual (BAU) 10-year capital plan.**

- **The next 20 years will be fun!**



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For More Information

For additional Information, contact
Modern Grid Strategy Team

<http://www.netl.doe.gov/moderngrid>

304-599-4273 x101

Links:

- [The Modern Grid Strategy](#)
- [Smart Grid Newsletter](#)
- [EPRI Intelligrid](#)
- [Galvin Electricity Initiative](#)
- [GridWise Alliance](#)
- [GridWise Architecture Council](#)
- [European SmartGrid Technology Platform](#)



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