

SGiP SMART GRID INTEROPERABILITY PANEL

GREEN BUTTON WORKSHOP

February 29, 2012 13:00-15:00 EST

Agenda PART I: Green Button Emerges

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- [Erich 1:00] Welcome and Introductions
- [Nick 1:10] What is Green Button and ESPI?
- [Marty 1:30] The Value Story
- [Dave 1:50] Roles of OSTP/DOE/NIST and SGIP/NAESB/UCAIug /EnergyOS/NREL
- [Marty 1:55] What Drives an Implementation
- [Nick 2:05] Who is Currently Implementing Green Button and What Are They Doing With It
- [Erich 2:15] Utility Lessons Learned



Agenda PART II: Under the Hood

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- [Marty 2:20] What is the Constellation of Development Tools and Collaboration Environments
- [Marty 2:40] Tools that are Currently Available and How They Work
- [Marty, Erich 2:50] Discussion about the Efforts Going Forward
- [2:55] Questions and Comments

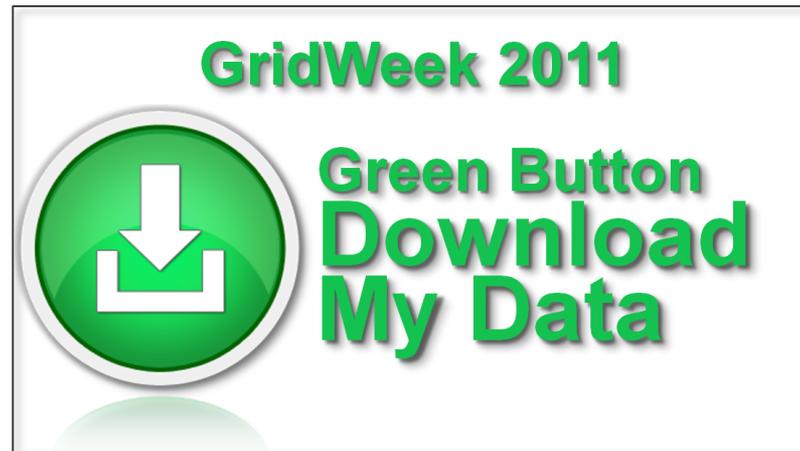


PART I: Green Button Emerges

What is Green Button and ESPI?

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- The Vision – collaboration and inspiration, using voluntary adoption of industry standards



- From concept to specification to implementation in 90 days

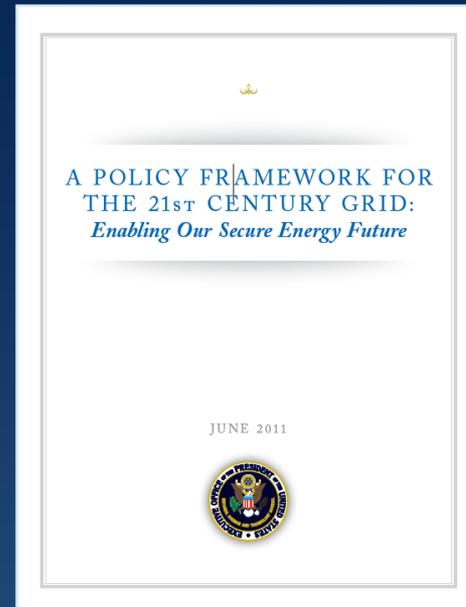
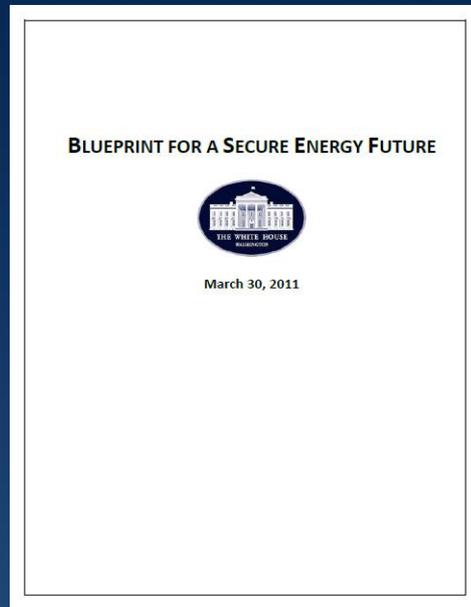


What is Green Button?

- *Common-sense idea that electricity customers should be able to download their own energy usage information in consumer- and computer-friendly format.*



Green Button in context of Administration's broader energy agenda



- *Unlock the potential for innovation in the electric sector*
- *Empower consumers and enable informed decision making*



What is Green Button data good for?

Empower Consumers and Spur Innovation



Insight: entrepreneur-created web portals analyze energy usage and provide actionable tips;

Heating and Cooling: customized heating and cooling activities for savings and comfort;

Education: community and student energy efficiency competitions;

Retrofits: improved decision-support tools to facilitate energy efficiency retrofits;

Verification: measurement of energy efficiency investments;

Real Estate: provide energy costs for tenants and/or new home purchasers; and

Solar: optimize the size and cost-effectiveness of rooftop solar panels.



September 2011 -- Challenge to Industry

January 2012 -- Celebrate California launch



CURRENTS WEEK IN REVIEW: OCTOBER 3-7, 2011

WHITE HOUSE CTO VISITS, PROMOTES "GREEN BUTTON" FOR ENERGY INFO

By the end of 2011, the three largest utilities will develop standard personalized energy usage reports that customers can click on a green button. If successful, the collaboration would lead to

All 3 CA utilities commit to “green button;” aligns with CPUC rulemaking on privacy, consumer access to energy data, and OIRA “smart disclosure” memo

As of January 18th, nearly 6 million households and 17 million residents in CA now have access to a Green Button.

At least 11.3 million *additional* households across the country will have Green Button access by the end of 2012.



What people are saying...

It may finally give consumers a reason to care about the smart grid.

– *SF Chronicle*

Solar companies are also eager for consumer data because understanding a homeowner's electricity use is key to the sales process.

– *San Jose Mercury News*

The project is important because it is a broad-based plan to take energy data and standardize the format of it, open it up (while also providing security) and make it readily available to consumers.

– Gigaom

I'm a big fan of simplicity and open standards to unleash a lot of innovation....I'm going to reach out to ConEd, the utility in NYC, and find out when they are going to add Green Button support to their consumers data. I hope it is soon.

– Fred Wilson (Venture Capitalist)

Among those in attendance was software developer Joss Scholten of Austin, Texas, who created an app in 12 hours using PG&E's green button. The app, which he displayed on his iPad, shows hourly, monthly and daily electric usage in a customer-friendly display.

– *PG&E Currents*



The Value Story

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- Why is this of interest to consumers
 - EUI is feedback mechanism for demand response
 - Knowledge is power
- ... to utilities
 - A well established specification will result in low cost of deployment of capabilities already planned and committed.
 - A single third party interface encourages value added services that don't depend on continuous utility innovation on this interface.
- ... to regulators
 - Adoption of demand side management schemes will require consumer feedback and engagement to enable them to benefit. Many regulators are interested in ubiquitous low cost Green Button capabilities to enable consumer engagement and support return on investments .
- ... to implementers
 - A single interface allows robust applications to be developed
 - Focus on value added rather than multiple custom interfaces per utility
- An ecosystem of goods and services built around concrete standard
 - Web applications
 - Desktop applications
 - Appliance applications



Some Context for Energy Usage Information

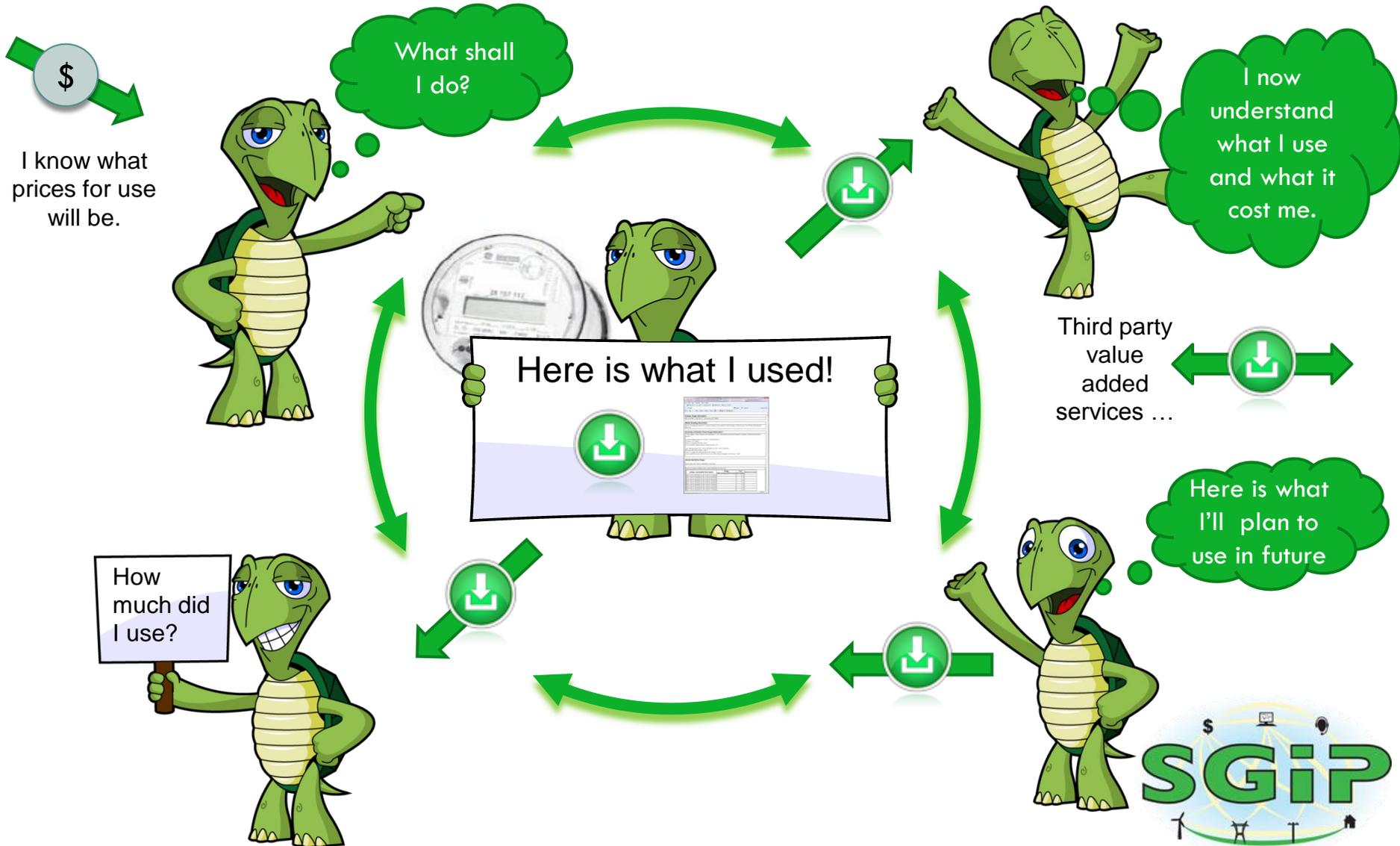
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- When a meter is read, this is the origin of EUI
- When a consumer participates in a demand response program, his EUI (including its cost) is key feedback to the consumer of the consequences of their actions
- When a consumer plans how to conserve energy, EUI is the reference that they use for study/planning
- Appliances and devices operating on behalf of the consumer can benefit from knowledge of past usage profiles.
- Businesses with energy controls use EUI as feedback to minimize cost and maximize comfort



Consumer Perspective

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Green Button Enabling Vision

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Usage Profile

Overall Usage

Cost of Usage



Which is Which

- OpenADE: Requirements specification for secure delivery of historical and ongoing usage information to 3rd Party
- PAP 10: Seed standard that defines a common energy usage information data model, for use across and interoperability between multiple standards
- NAESB ESPI: Standard that satisfies the requirements laid out in OpenADE and incorporates the data model from NAESB PAP 10 Energy Usage Information
- Green Button: File format subset of ESPI provides usage information to the consumer's via Web site



Key Organizational Roles in the Green Button Ecosystem

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- OSTP
- DOE
- NIST
- SGIP
- NAESB
- UCAIug
- EnergyOS
- Others
 - NREL / OpenEI
 - ...



US Government Smart Grid Activities

Agencies

- DOE
 - OE
 - ARPA-E, EERE
- Commerce
 - NIST
 - ITA
- FERC
- USDA/RUS
- EPA
- DOD
- DHS
- FCC, ...

Functions/Roles

- Smart Grid Task Force Coordination
- Accelerate standards development and use
- Promote SG technology exports
- R&D
- Demonstration and deployment
- Cyber Security
- Interstate Regulation
- Owner of assets & systems
- Spectrum / communications policy



[Marty or Dave] Steps Towards Green Button Implementation

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Milestones

1Q2007 EISA

2Q2009 NIST
Three Phase Plan

4Q2010 NAESB
PAP10 EUI

2Q2011 Policy
Framework for
the 21st Century
Grid

4Q2011 NAESB ESPI

4Q2011 Green
Button Initiative



- NIST has been given "primary responsibility to coordinate development of a framework that includes protocols and model standards for information management to achieve interoperability of smart grid devices and systems."
- NIST established Smart Grid Interoperability Panel (SGIP) to come into existence and established Priority Action Plans including PAP10 for standard Energy Usage Information (EUI)
- NAESB Completed REQ18/WEQ19 PAP10 EUI in October 2010
- From Policy Framework: "Key Action 8. Building on recent efforts, state policymakers should continue to consider how to develop policies and strategies to ensure that consumers receive timely access to, and have control over, machine-readable information about their energy consumption in a standard format."
- NAESB Completed REQ21 ESPI in September 2011, ratified October 2011
- U.S. Chief Technology Officer Aneesh Chopra challenged utilities across the country to develop a "Green Button"—detailed customer usage information available for download in a simple, common format.
- CA IOUs collaborate on PAP10 + ESPI EUI Implementation of Green Button
- Additional implementers announce plans



Green Button TimeLine

Many companies pushing
Utilities for proprietary
3rd party interfaces

2008

2009

2010

2011

2012

OpenADE TF Formed

OpenADE Reqs PAP10

NAESB PAP10 Standard Ratified

PAP10 Accepted to NIST CoS

US CTO Green Button Initiative

NAESB ESPI Standard Ratified

PG&E, SCE, SDG&E Implement

ADE Concept Meeting

- | | |
|-------------|---------------|
| ■ Oracle | ■ PG&E |
| ■ Microsoft | ■ Sempra |
| ■ Google | ■ Oncor |
| ■ Tendril | ■ Duke |
| ■ GreenBox | ■ Reliant |
| ■ Control4 | ■ Consumers |
| ■ EnerNex | ■ Centerpoint |
| ■ Xtensible | ■ AEP |
| ■ SCE | ■ FPL |



How SGIP Inspired Green Button Format

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- PAP10 was formed at the start of the SGIP to facilitate the standardization of Energy Usage Information
 - Resulted in NAESB REQ18/WEQ19 PAP10 EUI standard in December 2010
 - This was an information model standard, “seed standard” for other standards to use.
- PAP10 EUI was taken up by NAESB REQ21 Energy Services Provider Interface
 - Based on UCAIug OpenADE and NAESB PAP10 standards
 - Ratified in October 2011
 - How to represent EUI in XML, and,
 - How to exchange it between utilities and third parties on behalf of consumers
- Together these define a flexible file format for Green Button based on ratified standards from NAESB
- The initial implementations of Green Button are narrowing in on a specific subset of ESPI and EUI for its realization

What Drives Implementation

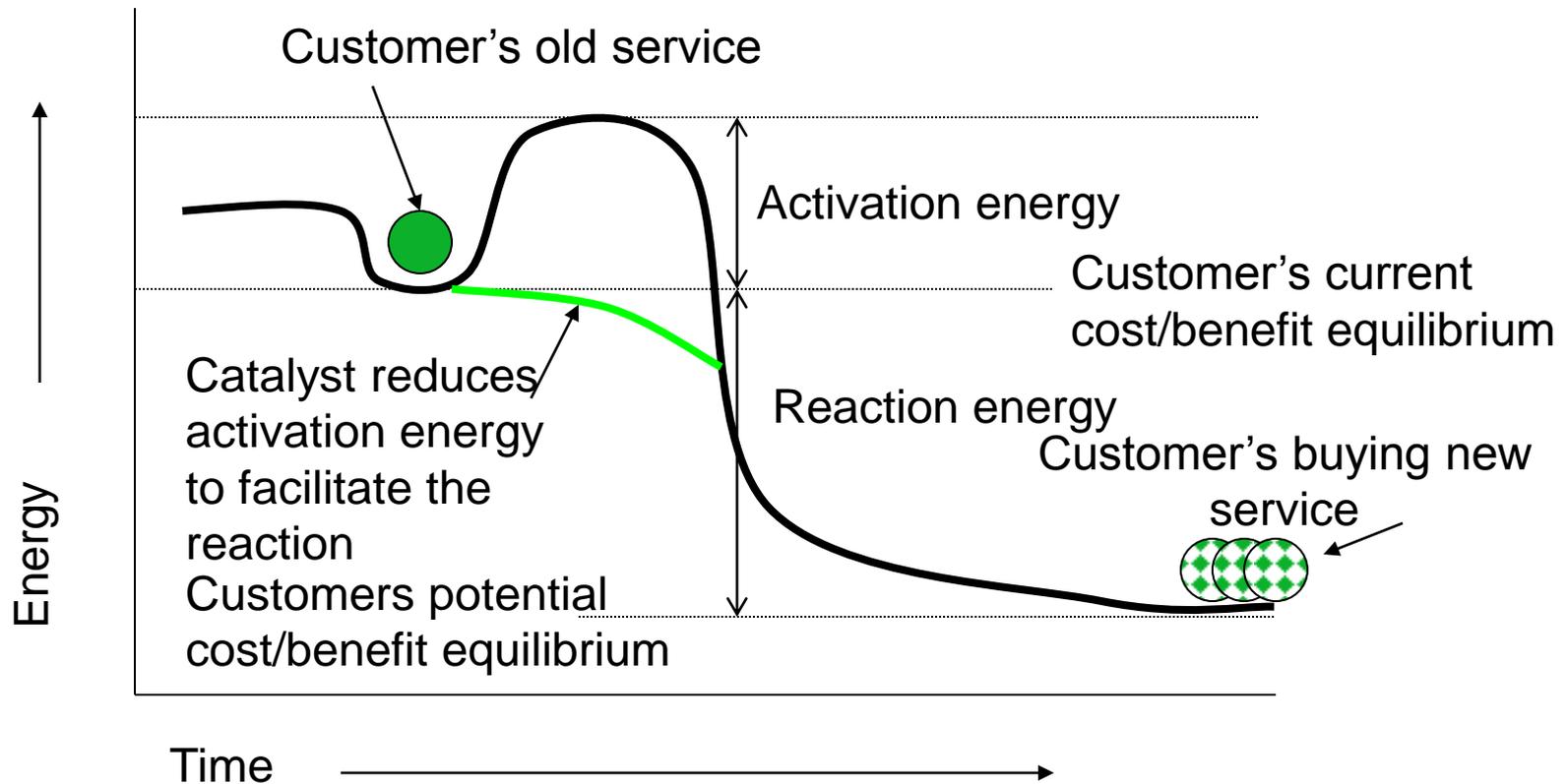
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- It was great to get Green Button off the mark with a quick demonstration of its capabilities, its another goal to support a sustained Green Button infused ecosystem.
- Keys:
 - Benefits drive adoption, barriers slow adoption
 - Therefore, minimize barriers to adoption
 - Diffusion and Catalysis
 - Three components to drive interoperability



The Catalytic Effect on Chemical Reactions

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Illustrative Example: $H_2 + O_2$ with "spark" as catalyst releases energy and water and fast; without spark, they will not appreciably react



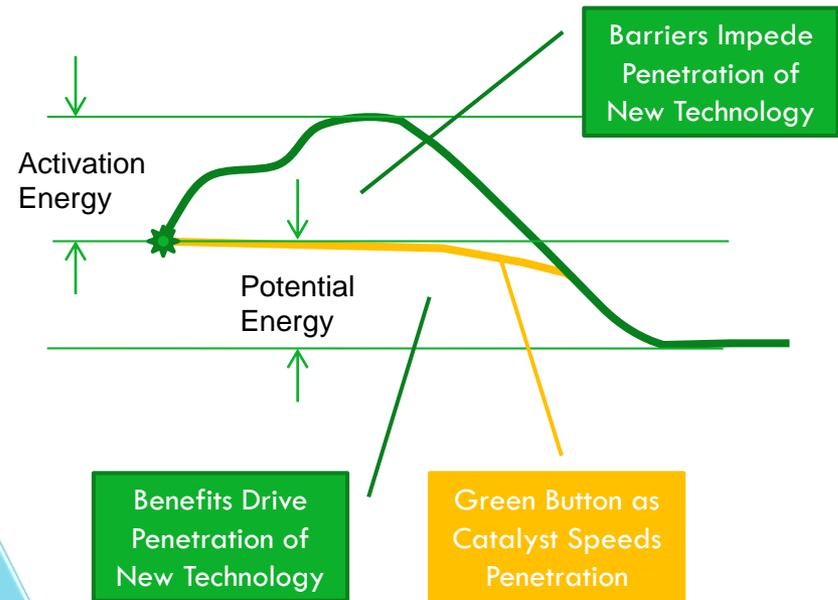
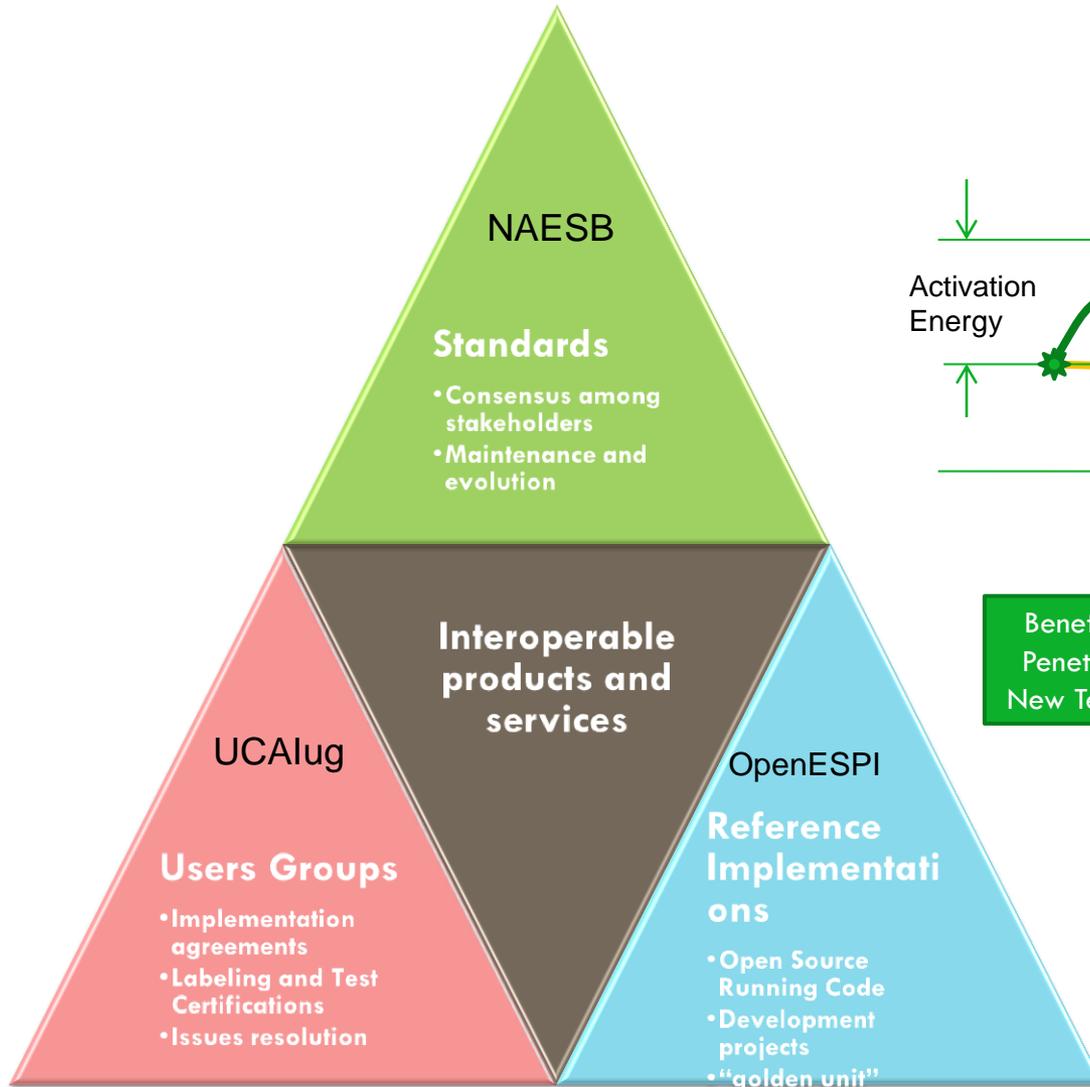
Diffusion Rate and Market Penetration

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- Diffusion is a good model for consumer markets
- Market penetration of goods & services
 - $dP/dt = k * (1-P)$ for a simple first order process
 - P = penetration, t = time, k = diffusion rate constant
 - dP/dt = rate of penetration
- k is determined by balance between driving force and resistance
 - k = Benefits / Cost Barriers
 - Cost Barriers = $f(\text{price, distribution complexity, service, well positioned standards, tools, ...})$
- Catalysts work by Increasing k



How to Reduce Barriers to Penetration



Utility Lessons Learned

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PART II Kicking the Tires

What is the Constellation of Development Tools and Collaboration Environments

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- Composition of Green Button Data
- Green Button SDK
- OpenESPI an open-source ESPI implementation
- UCAIug Test Plans



GreenButtonData – Live!!

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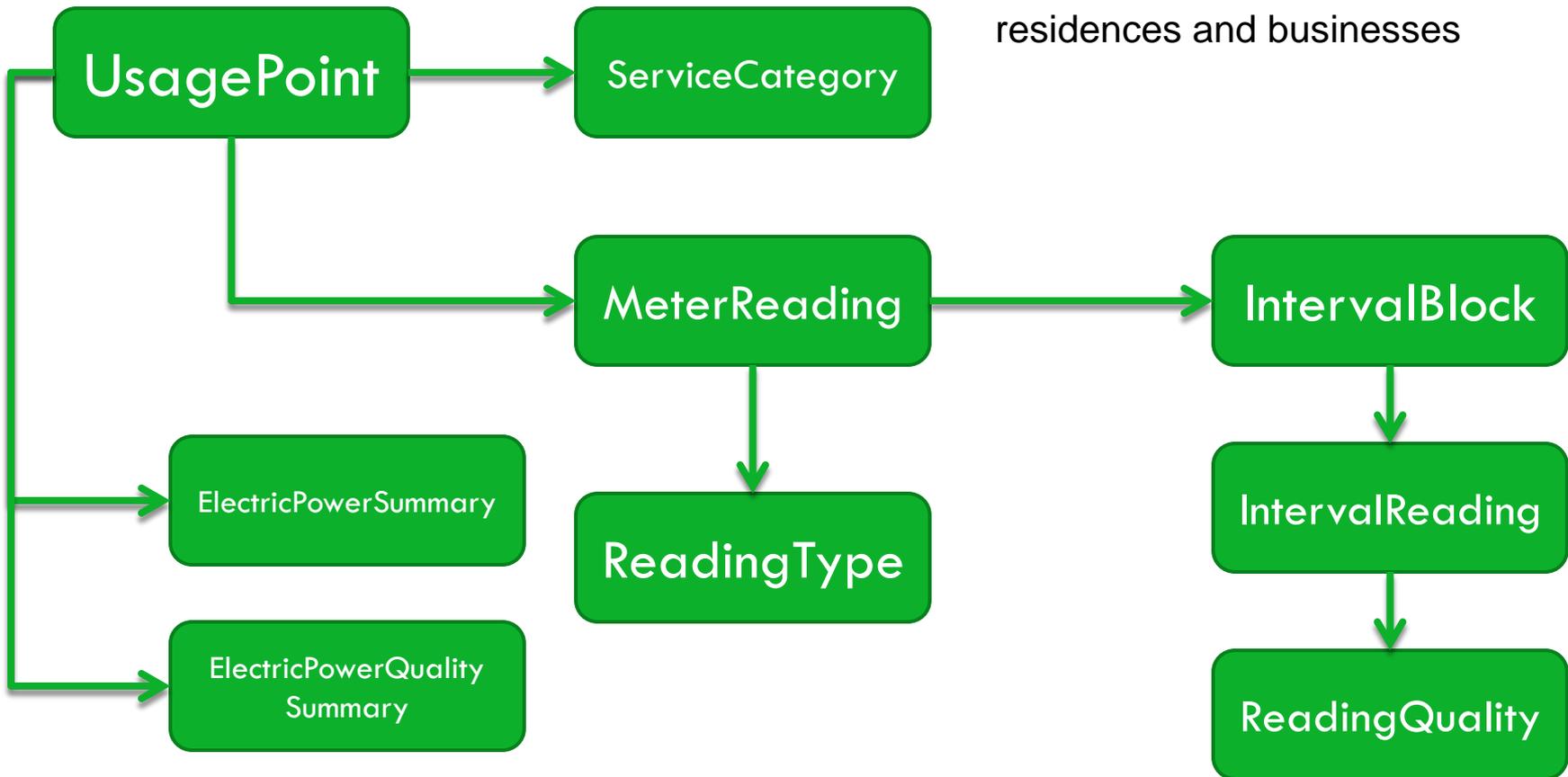
- www.greenbuttondata.org



Composition of Energy Usage Information

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EUI comes from and to residences and businesses

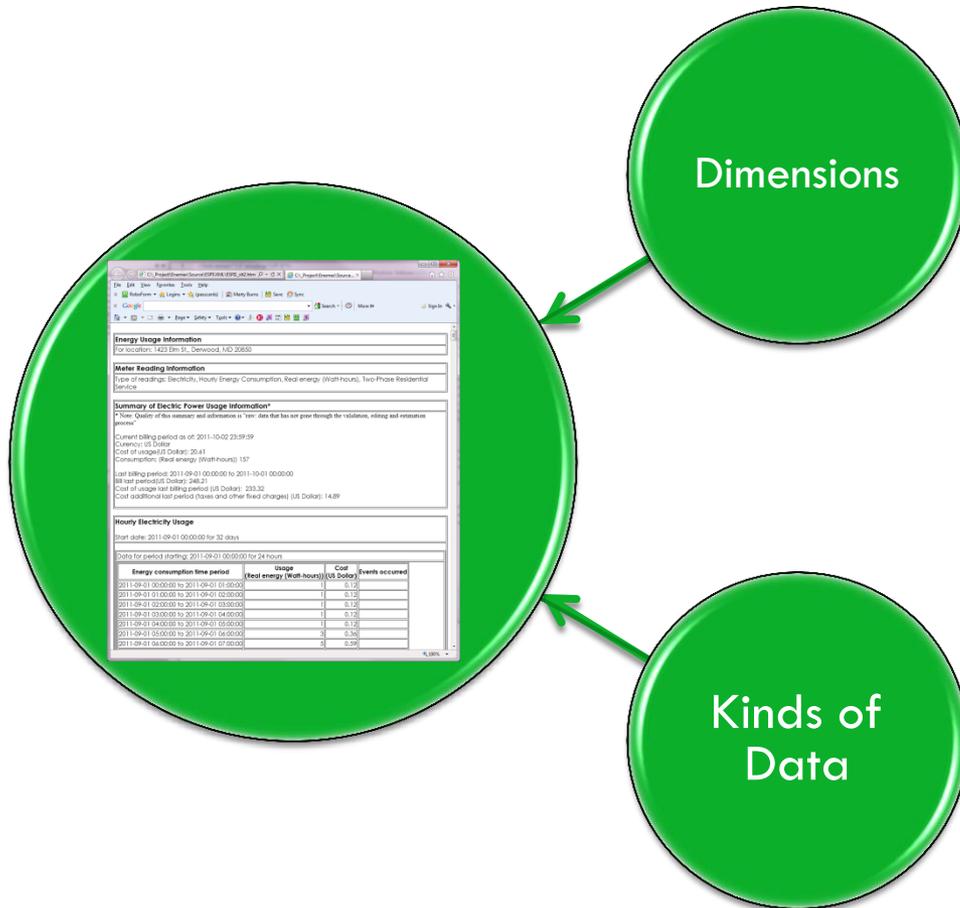


Note: This information is multidimensional. Many different reading types, summaries, and readings possible. i.e. not “flat”



Diversity of Information in EUI

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- Measurements of power, energy, gas, water, ...
- Quality: Raw, validated, estimated, ...
- Source: Meter near real-time, utility back end, third party
- Economics: Consumers need to know the cost of their consumed power (but we did not construct a pricing model)
- Identification: by customer, device, location

- Readings
- Interval data
- Summary Information
- Power Quality Metrics



Examples of Green Button Data

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- Hourly load profile for past billing period plus current period to date
- Fifteen-minute load profile for most recent 15 days
- Daily load profile for past month or year
- Summary only data
- Energy usage and energy demand readings
- Gas, water usage profiles
- Yearly summary data with monthly parts



Green Button SDK

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- [GETBatchSampleEUI.xml](#): Sample Green Button EUI File
- [ESPIRender_xslt1.xslt](#): XSLT Rendering Style Sheet
- [Green Button Data Generator Spreadsheet](#): Available for download from OpenESPI on GitHub
- [espi.xsd, atom.xsd](#): schemas constrain xml documents
- NAESB Green Button Portal - http://www.naesb.org/ESPI_Standards.asp
- To purchase the NAESB ESPI Standard on which the Green Button file format is based, use the following link: http://www.naesb.org/misc/naesb_matl_order_espi_standards.pdf
- <http://www.GreenButtonData.org> – sample/test web site



Tools Currently Available and How They Work

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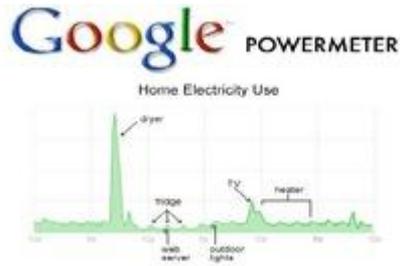
- WC3 standard components – xsd, xslt, xml
- OpenESPI development environment
- Development Virtual Machine
- Graphics and Indicia



Alternate Paths to EUI – Single Format

Sources of EUI

Power Utility



Via: ESPI, SEP2, Web Portal

Single Data Format: all at once

Energy Usage Information
For location: 1423 Elm St., Delwood, MD 20850

Meter Reading Information
Type of readings: Electricity, Hourly Energy Consumption, Real energy (Watt-hours), Two-Phase Residential Service

Summary of Electric Power Usage Information*
* Note: Quality of this summary and advertisement is "raw": data that has not gone through the validation, editing and estimation process.
Current billing period as of: 2011-10-02 23:59:59
Currency: US Dollar
Cost of usage (US Dollar): 20.61
Consumption: (Real energy (Watt-hours)) 157
Last billing period: 2011-09-01 00:00:00 to 2011-10-01 00:00:00
kWh last period (US Dollar): 248.21
Cost of usage last billing period (US Dollar): 233.32
Cost additional last period (taxes and other fixed charges) (US Dollar): 14.89

Hourly Electricity Usage
Start date: 2011-09-01 00:00:00 for 32 days
Data for period starting: 2011-09-01 00:00:00 for 24 hours

Energy consumption time period	Usage (Real energy (Watt-hours))	Cost (US Dollar)	Events occurred
2011-09-01 00:00:00 to 2011-09-01 01:00:00	1	0.12	
2011-09-01 01:00:00 to 2011-09-01 02:00:00	1	0.12	
2011-09-01 02:00:00 to 2011-09-01 03:00:00	1	0.12	
2011-09-01 03:00:00 to 2011-09-01 04:00:00	1	0.12	
2011-09-01 04:00:00 to 2011-09-01 05:00:00	1	0.12	
2011-09-01 05:00:00 to 2011-09-01 06:00:00	3	0.36	
2011-09-01 06:00:00 to 2011-09-01 07:00:00	3	0.36	

Single Data Format: as sequence

Energy Usage Information
For location: 1423 Elm St., Delwood, MD 20850

Meter Reading Information
Type of readings: Electricity, Hourly Energy Consumption, Real energy (Watt-hours), Two-Phase Residential Service

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kWh last period (US Dollar): 248.21
Cost of usage last billing period (US Dollar): 233.32
Cost additional last period (taxes and other fixed charges) (US Dollar): 14.89

DATA FOR ENERGY USAGE (ALL ENERGY INFORMATION) BY PERIOD

Energy consumption time period	Usage (Real energy (Watt-hours))	Cost (US Dollar)	Events occurred
2011-09-01 00:00:00 to 2011-09-01 01:00:00	1	0.12	
2011-09-01 01:00:00 to 2011-09-01 02:00:00	1	0.12	
2011-09-01 02:00:00 to 2011-09-01 03:00:00	1	0.12	
2011-09-01 03:00:00 to 2011-09-01 04:00:00	1	0.12	
2011-09-01 04:00:00 to 2011-09-01 05:00:00	1	0.12	
2011-09-01 05:00:00 to 2011-09-01 06:00:00	3	0.36	
2011-09-01 06:00:00 to 2011-09-01 07:00:00	3	0.36	

Uses of EUI



Green Button Schemas: Views in XMLSpy™

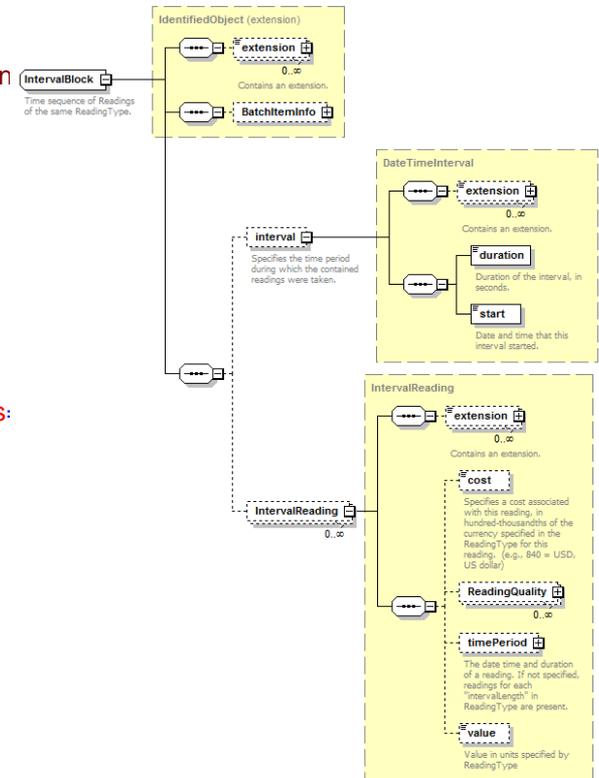
36

“colored text”

```

<xs:complexType name="IntervalBlock">
  <xs:annotation>
    <xs:documentation>Time sequence of Readings of the same ReadingType.</xs:documentation>
  </xs:annotation>
  <xs:complexContent>
    <xs:extension base="IdentifiedObject">
      <xs:sequence>
        <xs:element name="interval" type="DateTimeInterval" minOccurs="0">
          <xs:annotation>
            <xs:documentation>Specifies the time
              period during which the contained readings were taken.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name="IntervalReading" type="IntervalReading" minOccurs="0" maxOccurs:
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  
```

“graphic view”



“grid view”

xs:complexType	
name	IntervalBlock
xs:annotation	
xs:complexContent	
xs:extension	
base	IdentifiedObject
xs:sequence	
xs:element	
name	Interval
type	DateTimeInterval
minOccurs	0
xs:annotation	
xs:documentation	Specifies the time period during which the contained readings were taken.
xs:element	
name	IntervalReading
type	IntervalReading
minOccurs	0
maxOccurs	unbounded



Green Button Data XML File

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The screenshot shows an XML viewer window titled 'GETBatchSampleEUI.xml'. The XML structure is as follows:

```
xml-stYLESHEET type="text/xsl" href="ESPIRender_xslt1.xslt"
feed
  xmlns http://www.w3.org/2005/Atom
  xmlns:xsi http://www.w3.org/2001/XMLSchema-instance
  xsi:schemaLocation="http://naesb.org/espi/espiDerived.xsd"
  id urn:uuid:046638c0-8701-11e0-9d78-0800200c9a66
  title ThirdPartyX Batch Feed
  updated 2012-05-21T18:01:00Z
  link
    rel self
    href /ThirdParty/83e269c1/Batch
  entry (5)
    id urn:uuid:c990b150-8320-11e0-9d78-0800200c9a66
    link (3)
    title 1423 Elm St., Derwood, MD 20850
    content
      UsagePoint xmlns=http://naesb.org/espi
    title 2012-05-21T18:01:00Z
    id urn:uuid:f2034e91-8320-11e0-9d78-0800200c9a66
    link (4)
    title Hourly Energy Consumption
    content
      MeterReading xmlns=http://naesb.org/espi
    title 2012-05-21T18:01:00Z
    id urn:uuid:f2034e93-8320-11e0-9d78-0800200c9a66
    link (2)
    title
    content
      IntervalBlock (32)
    title 2012-05-21T18:01:00Z
    id urn:uuid:2557def0-8321-11e0-9d78-0800200c9a66
    link (2)
    title Energy Delivered (kWh)
    content
      ReadingType xmlns=http://naesb.org/espi
    title 2012-05-21T18:01:00Z
    id urn:uuid:3557def0-8321-11e0-9d78-0800200c9a66
    link (2)
    title Usage Summary
    content
      ElectricPowerUsageSummary xmlns=h
```

UsagePoint

MeterReading

MeterReading

ReadingType

ElectricPower
UsageSummary



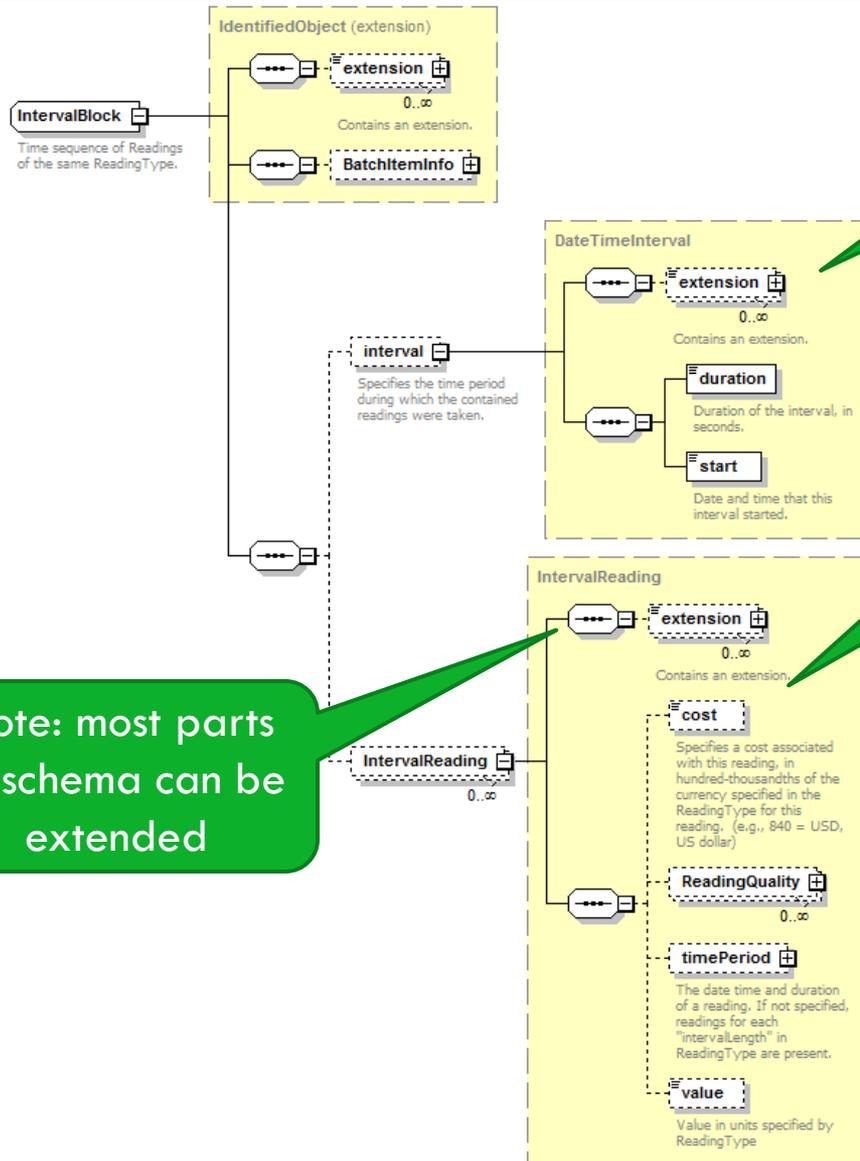
Atom Pub Links for Entries

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Green Button Schemas: IntervalBlock

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IntervalBlock has an Interval time definition

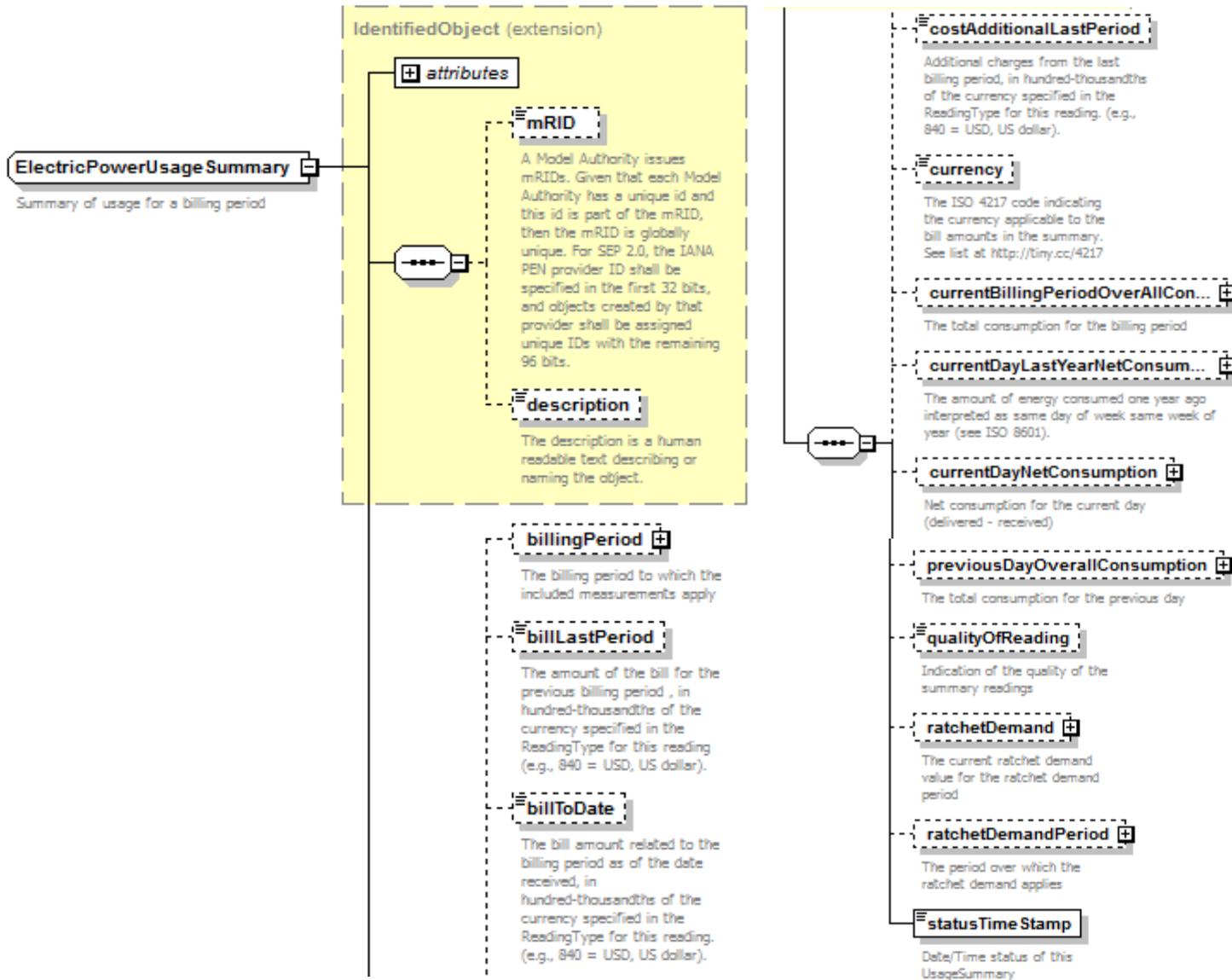
The IntervalReadings have values, cost, and reading quality, as well as optional time period

Note: most parts of schema can be extended



Green Button Schemas: ElectricPowerUsageSummary

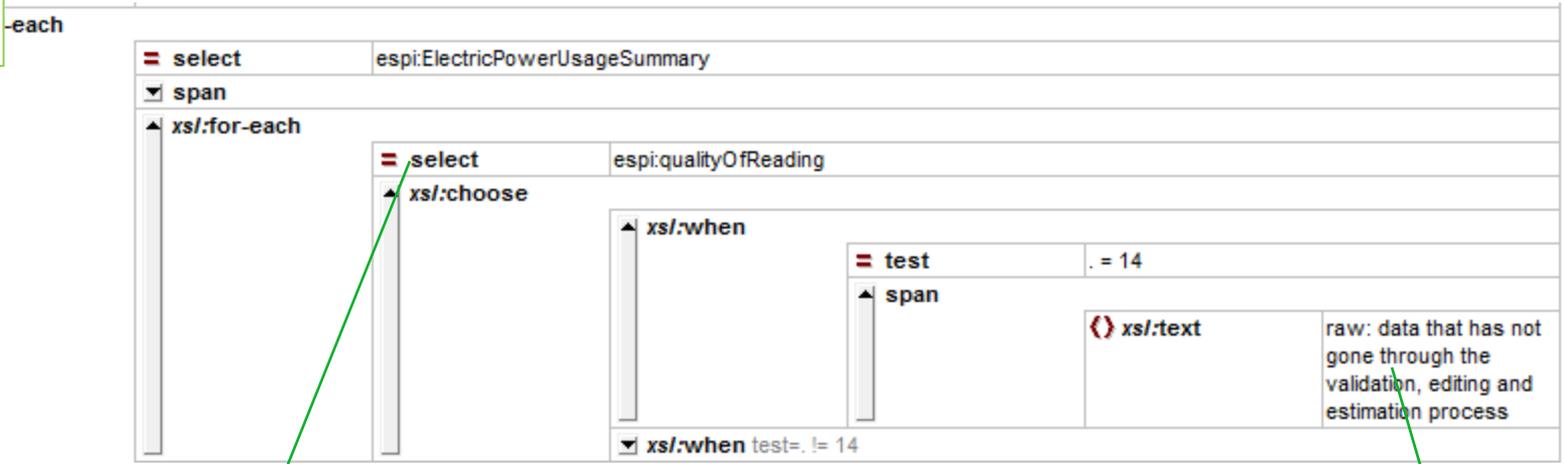
40



Green Button Sample XSLT

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XSLT



XML

```

ElectricPowerUsageSummary xmlns="http://naesb.org/espi">
  <billingPeriod>
    <duration>2592000</duration>
    <start>1314835200</start>
  </billingPeriod>
  <billLastPeriod>24820832</billLastPeriod>
  <billToDate>2060508</billToDate>
  <costAdditionalLastPeriod>1489250</costAdditionalLastPeriod>
  <currency>840</currency>
  <currentBillingPeriodOverAllConsumption>
    <powerOfTenMultiplier>3</powerOfTenMultiplier>
    <timeStamp>1317599999</timeStamp>
    <uom>72</uom>
    <value>157</value>
  </currentBillingPeriodOverAllConsumption>
  <qualityOfReading>14</qualityOfReading>
  <statusTimeStamp>1317599999</statusTimeStamp>
</ElectricPowerUsageSummary>
    
```

HTML

Summary of Electric Power Usage Information

* Note: Quality of this summary and information is "raw: data that has not gone through the validation, editing and estimation process"

Current billing period as of: 2011-10-02 23:59:59
 Currency: US Dollar
 Cost of usage(US Dollar): 20.61
 Consumption(Real energy (Watt-hours)) :157



Binding Green Button File to XSLT and XSD

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The screenshot shows a web browser window displaying an XML feed titled "GETBatchSampleEUI.xml". The browser's address bar shows the URL "http://www.w3.org/2005/Atom". The XML content is displayed in a structured view, showing a root element "feed" with several attributes and a "link" element. The "link" element has a "rel" attribute set to "self" and a "href" attribute pointing to "/ThirdParty/83e269c1/Batch". Below the "link" element, there are five "entry" elements, each with an "id", "link", "title", and "content" attribute. The "content" attribute is expanded to show a list of elements: "UsagePoint", "MeterReading", "IntervalBlock", "ReadingType", and "ElectricPowerUsageSummary".

Annotations in the image highlight two key elements:

- Identify XSLT Style Sheet:** A green callout box points to the "xml-style-sheet" element in the XML, which has a "type" attribute set to "text/xsl" and a "href" attribute pointing to "ESPRender_xslt1.xslt".
- Identify XSD Schema Location:** A green callout box points to the "xsi:schemaLocation" attribute in the XML, which points to "http://naesb.org/espi/espiDerived.xsd".

id	link	title	content
1 urn:uuid:c990b150-8320-11e0-9d78-0800200c9a66	link (3)	1423 Elm St., Derwood, MD 20850	content
2 urn:uuid:f2034e91-8320-11e0-9d78-0800200c9a66	link (4)	Hourly Energy Consumption	content
3 urn:uuid:f2034e93-8320-11e0-9d78-0800200c9a66	link (2)		content
4 urn:uuid:2557def0-8321-11e0-9d78-0800200c9a66	link (2)	Energy Delivered (kWh)	content
5 urn:uuid:3557def0-8321-11e0-9d78-0800200c9a66	link (2)	Usage Summary	content



Green Button Data File Generator

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Set the structure of the intervals and blocks

OUTPUT_FILENAME temp.xml

GenerateGreenButton Data File

2/23/2012 10:36

Utility Bill - Flat rate power Charges, Hourly readings	Information Setting	Variables in Simulation
Output file name	temp.xml	
Start of last Billing Period	9/1/11 0:00	1314835200
Duration of Last Billing Period in Days	30	2592000
Interval Block Duration Secs	86400	86400
Interval Duration Secs	3600	3600
End of Simulation	10/2/11 23:59	1317599999
Typical monthly usage (used for scaling)	2070.00	
Base Cost Per KWH (will be scaled by weights)	\$0.03	
Multiplier for Wh (power of 10 exponent) in Data	0	
Additional Charges On Bill Last Period	\$13.46	1346000
Customer Title	38 Oak Place, Montclair, NJ 07042	
Service Kind	0	
Interval Block Index	0173	
Batch Index	83e269c1	
MeterReading Index	01	
ReadingType Index	07	
UsagePoint Index	01	
URL for Customer Data	/User/9b6c7063	

Ready Overview EUIGenerator Computations 100%

Set weightings for weekdays and weekends

Time of Day for reference profiles	Weighting		Cost Weighting	
	Weekday	Weekend	Weekday	Weekend
12:00:00 AM	1	1	1	1
1:00:00 AM	1	1	1	1
2:00:00 AM	1	1	1	1
3:00:00 AM	1	1	1	1
4:00:00 AM	1	1	1	1
5:00:00 AM	3	3	1	1
6:00:00 AM	5	5	2	2
7:00:00 AM	5	5	2	2
8:00:00 AM	5	5	2	2
9:00:00 AM	5	5	2	2
10:00:00 AM	3	3	2	2
11:00:00 AM	3	3	2	2
12:00:00 PM	3	3	2	2
1:00:00 PM	3	3	2	2
2:00:00 PM	3	3	4	4
3:00:00 PM	3	3	6	6
4:00:00 PM	3	3	8	8
5:00:00 PM	4	4	10	10
6:00:00 PM	5	5	10	10
7:00:00 PM	5	5	8	8
8:00:00 PM	5	5	6	6
9:00:00 PM	5	5	4	4
10:00:00 PM	3	3	2	2
11:00:00 PM	1	1	1	1
Total	77	96	81	55



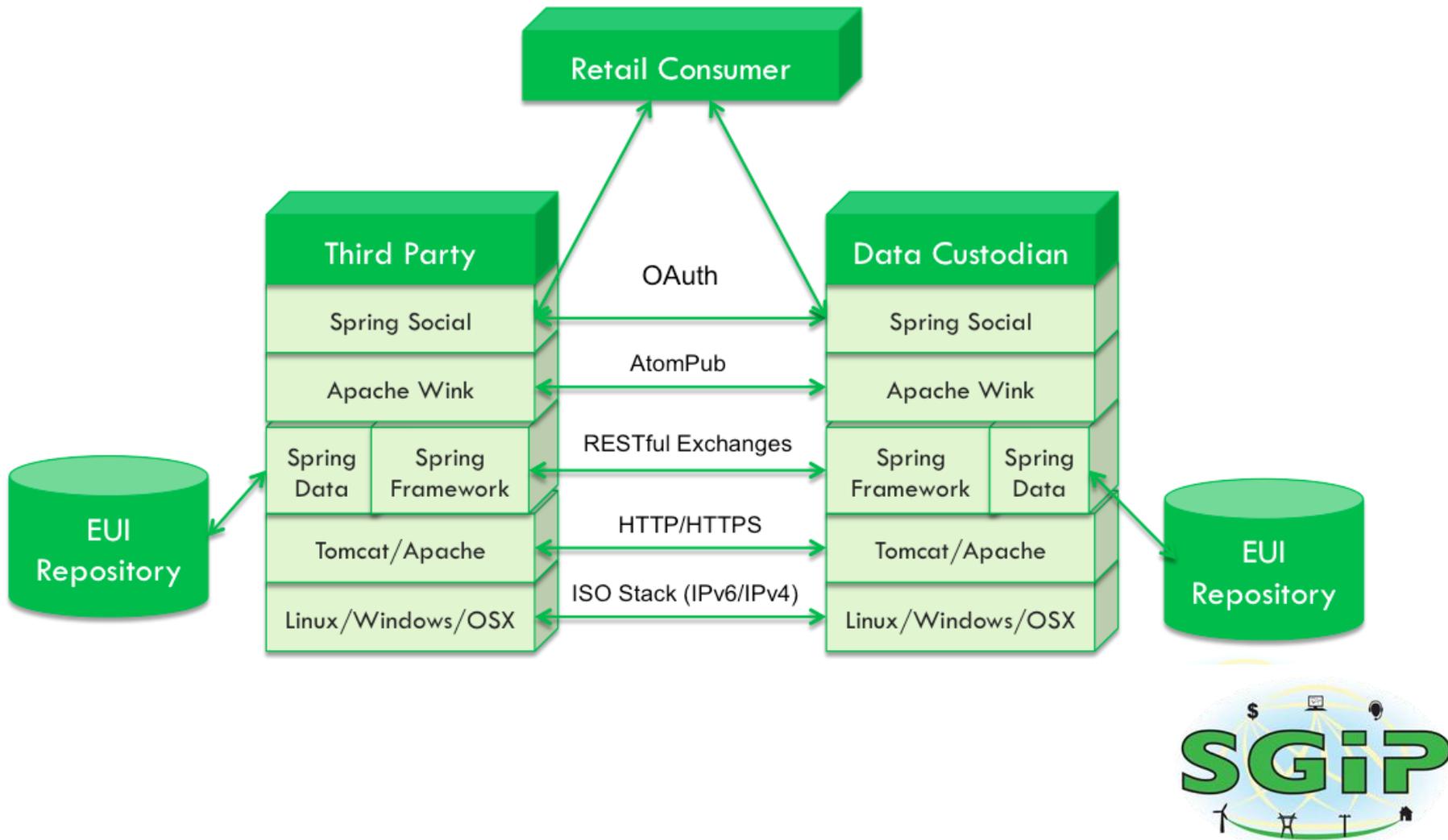
OpenESPI Software Architecture

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- Actors:
 - Consumer
 - Data Custodian
 - EnergyServiceProvider
- InformationElements:
 - Representations
 - EUI Data Repository
- UseCases/Sequences:
 - Scenario Automations
 - OAuth/AtomPub Patterns
 - Orchestration and Deployment
- Frameworks:
 - Spring Model/View/Controller
 - Spring Social (OAuth)
 - Apache Wink (AtomPub)
- Development Platform:
 - Eclipse Projects
 - Ubuntu VM
 - Java Builds
 - C++ Builds (future)
- Testing Plans:
 - JUnit + Spring Testing Framework
 - Selenium Automations

OpenESPI Frameworks – Spring Profile

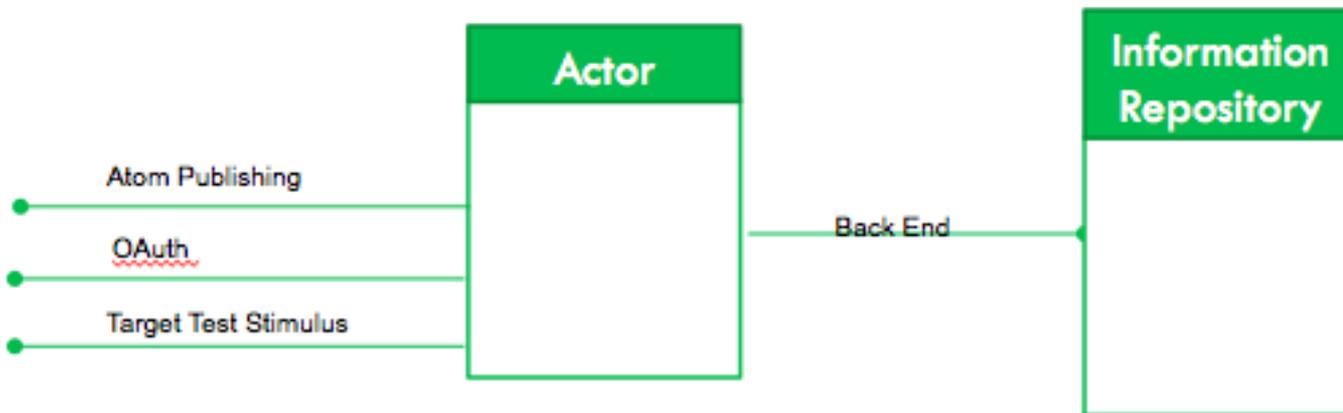
45



OpenESPI Component Model

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Three SW Components – DataCustodian, ThirdParty, RetailCustomer



Shared Information Model



Virtual Machine for OpenESPI Development

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- The OpenESPI Development Virtual Machine is a Linux Ubuntu desktop environment that may be used to jumpstart your OpenESPI development efforts. Further background on the VM may be found [HERE](#).
- The VM connects to the GitHub remote repository
- All Development Tools, Web Servers, and Test Tools are Incorporated into Free VM
- VM Player for Windows is Free
- VM Player for Apple is ~\$50



Green Button Graphics*

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Green Button Download My Data



GreenButtonIcons.zip

* Interim permission for use via VA cover letter



Discussion About the Tools and Testing Going Forward

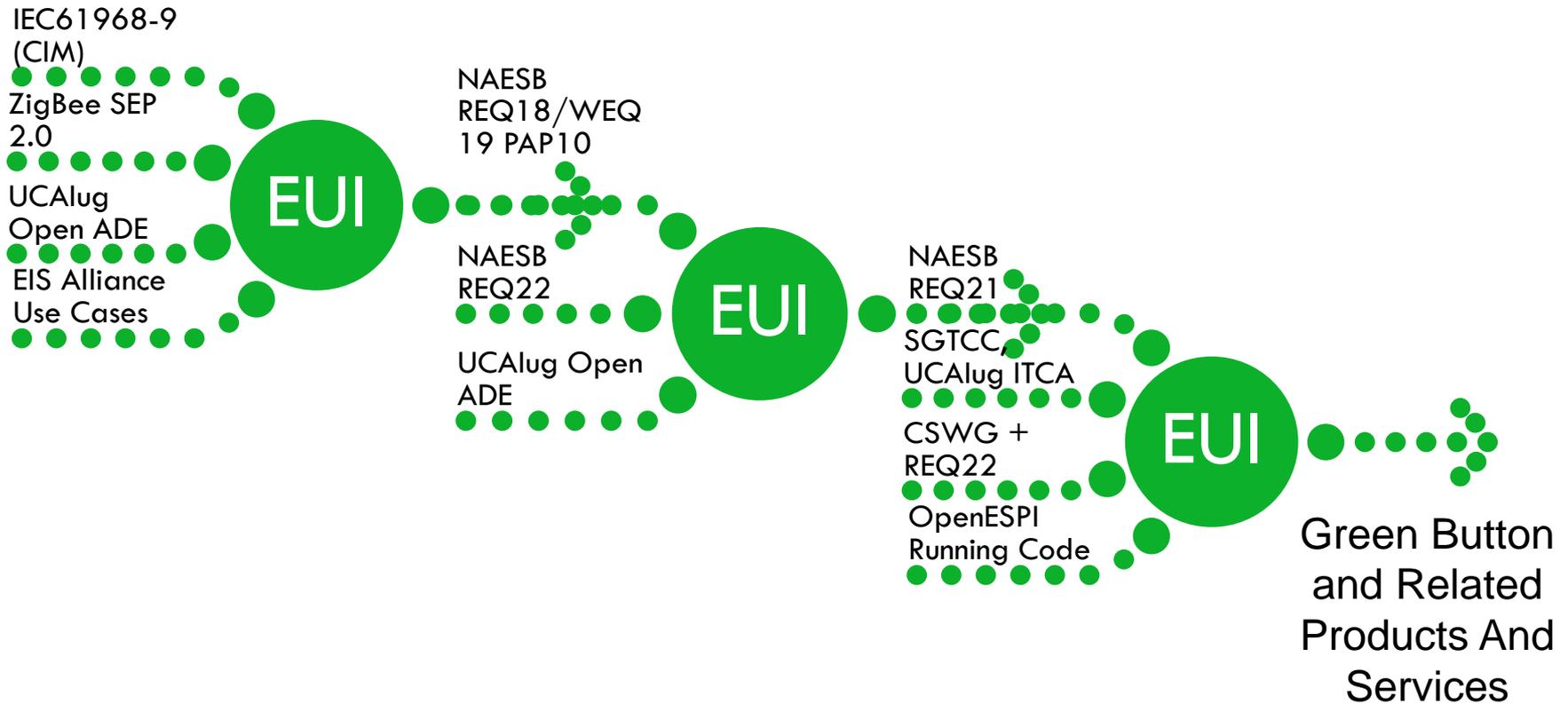
49

- Where work is occurring
 - Acceleration project for testing tools
 - User community to support
 - A Policy
 - A Brand
 - What Green Button is
 - End user applications
 - A Collection of technologies
 - Technical standards, test plans and certifications
- How to contribute
- How to comment/discuss



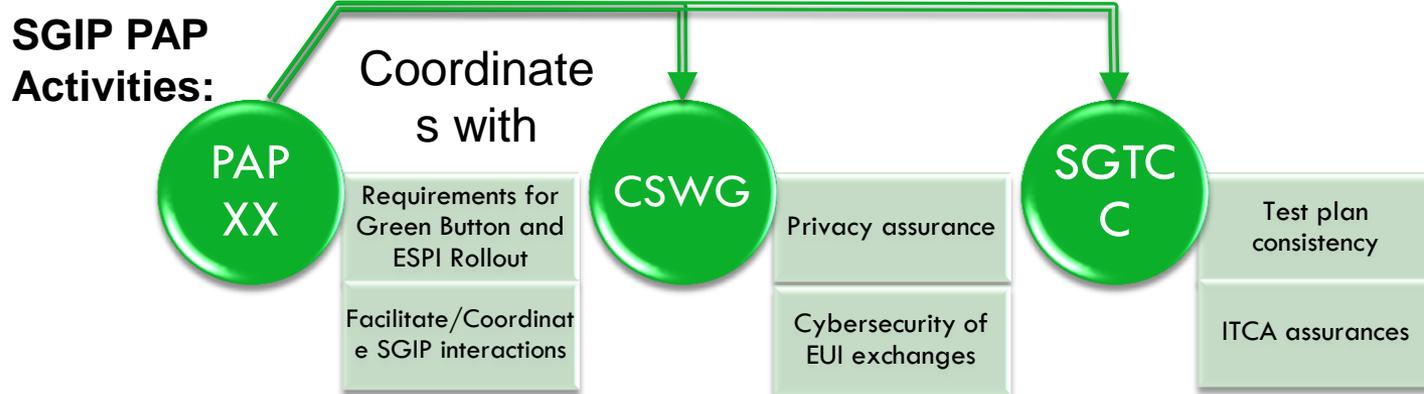
Evolution of Interoperability For EUI

50



SGIP PAPxx: ESPI and Green Button Roadmap

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Specification Deliverables:

Where:

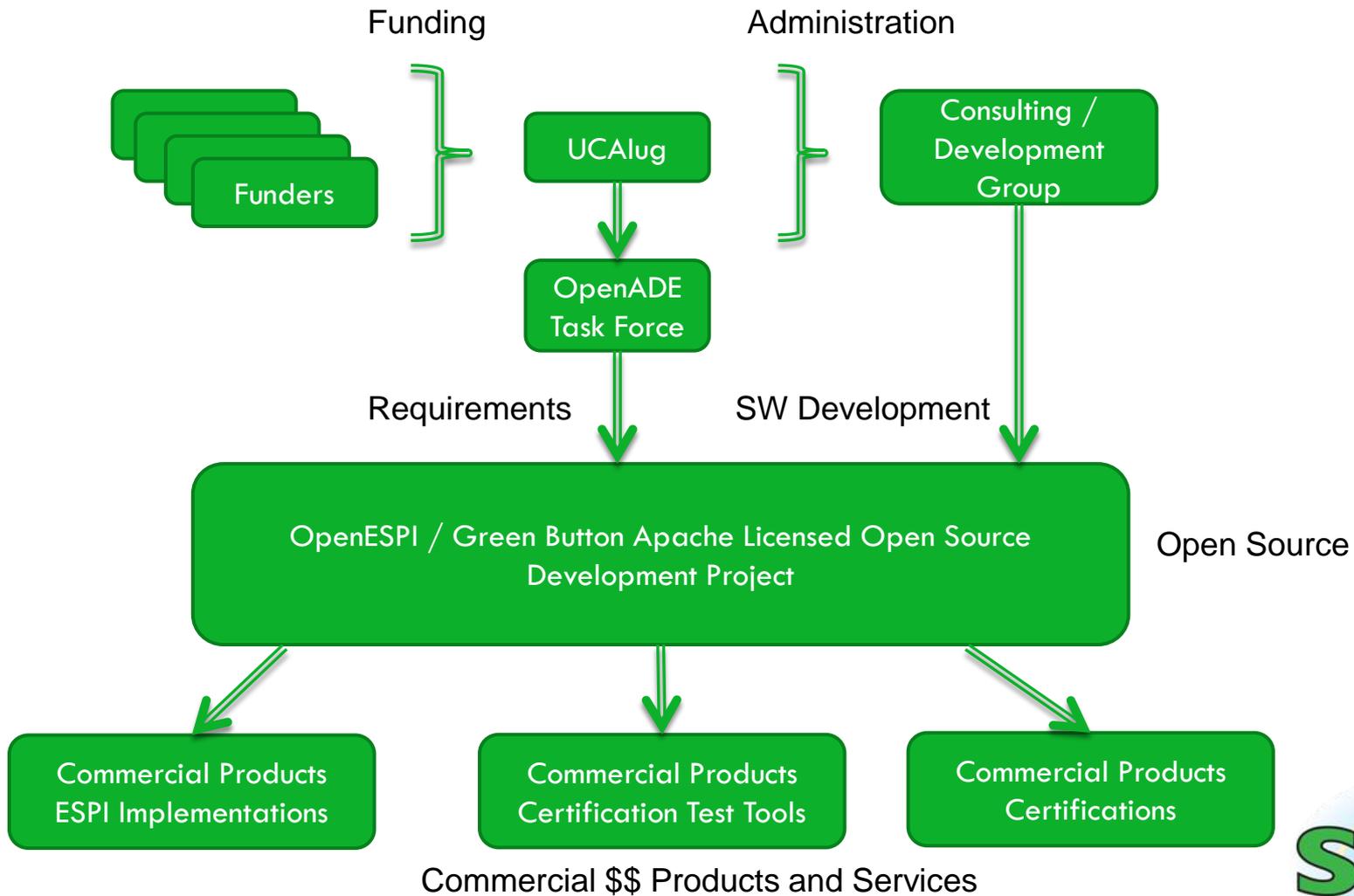
Standards (NAESB)	PAP 10 Maintenance Update	ESPI Errata Update	ESPI New Reqs Update	International Version
T&C (UCAIug)	Green Button Test Plan	ESPI Test Plan	UCAIug ITCA	
Implementation (EnergyOS)	Green Button SDK	OpenESPI		

Timeline:



How Open Source Can Work With Business Goals

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<http://collaborate.nist.gov/twiki-sggrid/bin/view/SmartGrid/GreenButtonInitiative>

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The screenshot shows a web browser window with the address bar containing the URL: collaborate.nist.gov/twiki-sggrid/bin/view/SmartGrid/GreenButtonInitiative. The page header features the NIST logo (National Institute of Standards and Technology) and the SGiP logo (NIST Smart Grid Collaboration Wiki Smart Grid Interoperability Panel Site). A navigation menu includes links for Home, About SGiP, Membership, Working Groups, Priority Action Plans, Knowledge Center (IKB), and News & Events. The main content area is titled "GREEN BUTTON INITIATIVE ARTIFACTS PAGE" and includes a "PAGE CONTENTS" section with a list of links: "Introducing the Green Button", "The Standards behind the Green Button", "Summary View of ESPI Model based on EUI", "Sources and Uses of EUI", "From W3C Standards + ESPI To Green Button File Format", "Some Technical Artifacts including SDK", and "Technical Activities". A prominent advertisement for a "Green Button Workshop" in Knoxville, TN on Feb. 29, 2012, is displayed, featuring a download icon and a "CLICK TO LEARN MORE" button. The left sidebar contains a "SmartGrid" section with a "Log In" button and a "Getting Started" section with a "Become A Member" button. A banner for a "Spring 2012 Face-to-Face" event in Charlotte, NC (March 20-22) is also visible, with a "REGISTRATION OPEN" button. The browser's taskbar at the bottom shows various icons, including "Logins", "Bookmarks", "Nist-SGiP TWIKI (+4)", "Marty Burns", "Save", "Generate", and "Sync".



REQ.21 – Energy Services Provider Interface

The purpose of the NAESB Energy Services Provider Interface (ESPI) standard (REQ.21) is to create a standardized process and interface for the exchange of a retail customer's energy usage information between their designated data custodian (i.e. distribution company) and an authorized third party service provider. Providing a consistent method for the authorization of third party access to retail consumer's usage information and a standardized interface for the exchange of that information will support the development of innovative products that will allow consumers to better understand their energy usage and to make more economical decisions about their usage. The NAESB ESPI standard provides model business practices, use cases, models and an XML schema that describe the mechanisms by which the orchestrated exchange of energy usage information may be enabled. The NAESB standards development effort was conducted with the support of the National Institute of Standards & Technology and the Smart Grid Interoperability Panel and serves as an extension of the NAESB Energy Usage Information Model developed at the request of NIST and the SGIP.

Green Button Initiative

In September 2011, Aneesh Chopra and the Office of Science and Technology Policy challenged the electric utility industry to launch a Green Button Initiative that would give consumers access to their energy usage information in a downloadable, easy-to-read format. This initiative is modeled after the Administration's Blue Button

Green Button Download



<http://osgug.ucaiug.org/sgsystems/OpenADE/default.aspx>

The screenshot shows a web browser window displaying the OpenADE website. The browser's address bar shows the URL osgug.ucaiug.org/sgsystems/OpenADE/default.aspx. The page header includes the text "Open Smart Grid - OpenSG" and "Login | Join". The main banner features the "OpenSG users group" logo and three images: a smart meter, a utility meter, and a server room. A navigation menu below the banner includes links for Home, SG Systems, SG Conformity, SG Security, SG Communications, SG Simulations, SG EIM, Meetings, and Other UCAIug Sites. A search bar is located below the navigation menu. The left sidebar contains sections for Sites (OpenSG Help Desk), Documents (Shared Documents), Lists (Calendar, Tasks), and People and Groups. The main content area displays a "Welcome!" message, a "Links" section with a list of resources, and two announcements: "NAESB ESPI 1.0 Ratified" (dated 11/10/2011) and "OpenADE 1.0 moving to NAESB SDO" (dated 8/11/2010).

Home - OpenADE

osgug.ucaiug.org/sgsystems/OpenADE/default.aspx

Open Smart Grid - OpenSG Login | Join

OpenSG users group

Home SG Systems SG Conformity SG Security SG Communications SG Simulations SG EIM Meetings Other UCAIug Sites

Search OSG Advanced Search

Open Smart Grid - OpenSG > SG Systems > OpenADE

Welcome!

Welcome to the OpenADE site! This site is used to collaborate and share information related to our work. The OpenADE Task Force is a group of smart energy management vendors, utilities, and consumer interests developing recommendations toward building interoperable data exchanges that will allow customer authorization and sharing of utility consumption information with 3rd party service providers. For more information, view our main OpenADE page and charter on Smartgridipedia!

Links

- OpenADE Charter
- OpenADE E-mail List
- OpenADE Service Requests
- EnergyOS OpenESPI Open Source Project
- NAESB ESPI Green Button Toolkit
- SGIP Green Button Initiative
- NAESB ESPI Task Force
- NAESB PAP 10
- SGIP PAP 10

Announcements

NAESB ESPI 1.0 Ratified 11/10/2011 11:28 AM
by steve.van ausdall
The NAESB ESPI committee and executive committee has approved and ratified the first version of Energy Services Provider Interface (ESPI), meeting OpenADE requirements for exchange of PAP 10-compliant usage data. The implementable standard model business...

OpenADE 1.0 moving to NAESB SDO 8/11/2010 12:25 PM
by steve.van ausdall
The OpenADE TF and related groups have completed the gathering of requirements and initial Services Definition work for OpenADE 1.0 within OpenSG, and have published our collective work for use / reference by any SDO or standards development effort...



www.GreenButtonData.org

Select Sample Data Set

View Sample Data

Download Sample Data

The Green Button Data Demonstration

The Green Button Challenge is one step towards realizing the common-sense idea that consumers should have access to their own energy usage information in a downloadable, easy-to-use electronic format, offered by their utility or retail energy service provider.

In September 2011, U.S. Chief Technology Officer Aneesh Chopra challenged utilities across the country to develop a "Green Button"-detailed customer usage information available for download in a simple, common format.

For further information:

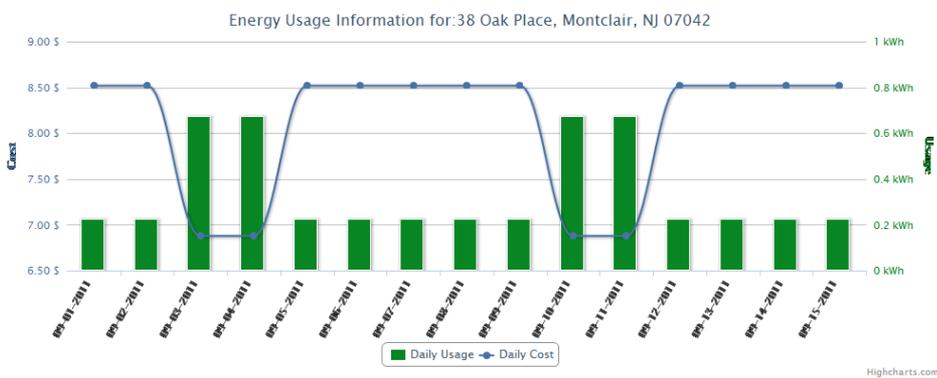
- [Empowering Customers With a Green Button | The White House](#)
- [NIST Smart Grid Green Button Initiative](#)

Please select a sample data file: then display or download by clicking on one of the Green Buttons.

After displaying, clicking on a Daily Usage bar navigates to Hourly Usage information for that day. Clicking again on an Hourly Usage bar navigates back to Daily Usage.

Green Button View My Data

Green Button Download My Data



Energy Usage Information

For location: 38 Oak Place, Montclair, NJ 07042

Meter Reading Information

Type of readings: Electricity, Hourly Energy Consumption, Real energy (Watt-hours), Two-Phase Residential Service



<http://openei.org>

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The screenshot shows a web browser window with the URL `en.openei.org/apps/?keyword=Green%20Button%20Apps`. The page header includes the OpenEI logo and navigation tabs for Wiki, Apps, Datasets, and Linked Data. A search bar is present with the text "Find apps: 5 for the web" and "1 for your mobile device". A green callout bubble points to the search results area.

OpenEI | OPENENERGYINFO

View login status by clicking here

Wiki Apps Datasets Linked Data

Browse

OpenEI Apps

Find apps: 5 for the web 1 for your mobile device

Search

GREEN BUTTON APPS
View, Access, and Share Green Button Apps

Use Green Button Apps to explore and share your energy use data!

If your energy provider displays the Green Button, click it to gain easy access to your energy use data.

Filter by app category 1

- 13 Featured
- 6 Green Button Apps
- 1 Community Generated

6 Tools filtered from 118 originally (Reset All Filters)

- EcoDog Green Button Tool
- Energy Insight
- EnergyAi
- Genability Explorer
- People Power 1.0
- Simple Energy

Green Button Apps



www.openespi.org

Home || [Discussions](#) || [GitHub Project](#) || [SGIP TWiki Green Button](#) || [SGIP PAP10 ESPI Work Area](#) || [NAESB ESPI Workarea](#) || [OpenSG/OpenADE](#)

OpenESPI

Helping to Build
[The Green Button!](#)

[Join the OpenESPI discussion](#)

Subscribe

Enter Your Email

The Energy Services Provider Interface (ESPI) provides a way for Energy Usage Information (EUI) to be shared, in a controlled manner, between participants in the energy services markets.

The OpenESPI project provides support for the development of deployable ESPI components that will help to rapidly and consistently engage the community with this exciting and enabling technology. Please read the [OpenESPI FAQ](#) for further information! In addition:

- [NAESB ESPI Workarea](#)
- [Order a Copy of the ESPI Standard \(PDF\)](#)
- [Green Button SDK Repository](#)
- [GitHub Source Code Repository](#)
- [Pre-Loaded Ubuntu/Eclipse Development Environment](#)

Data Custodian

- ESPI Server
- Web Portal

Third Party

- ESPI Client
- Web Portal

User Agent (Web Browser)
Retail Customer

RoboForm Search Logins Bookmarks (passcards) Marty Burns Save Generate Sync



<https://github.com/energyos/OpenESPI>

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The screenshot shows the GitHub repository page for `energyos/OpenESPI`. The page includes the GitHub logo, navigation links for "Signup and Pricing", "Explore GitHub", "Features", and "Blog". The repository name "energyos / OpenESPI" is displayed with "Watch", "Fork", and "10" icons. Below this, there are tabs for "Code", "Network", "Pull Requests (0)", "Issues (2)", "Wiki (10)", and "Stats & Graphs". The "Code" tab is active, showing the repository description: "The Open Source Energy Services Provider Interface Project — Read more" with a link to <http://www.openespi.org>. There are buttons for "ZIP", "HTTP", "Git Read-Only", and "Read+Write access" with the URL `https://github.com/energyos/OpenESPI.git`. A dropdown menu shows the current branch as "master". The "Files" tab is selected, showing a list of files with columns for "name", "age", and "message".

name	age	message
artifacts	3 months ago	Added Ancillary files to the re-start [energyos]
documents	3 months ago	Added Ancillary files to the re-start [energyos]
greenbuttonsdk	a month ago	Modified Unix Time conversions for round up errors. [MartyBurns]



Issues Resolution

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- Related to NAESB Standards, Test Plans, Branding of Green Button:
 - ▣ <http://osgug.ucaiug.org/HelpDesk/Lists/servicerequests/GreenButton.aspx>
- Related to Development Tools, Open Source, Implementation of Test
 - ▣ <https://github.com/energyos/OpenESPI/issues>



Links

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- NAESB
 - NAESB PAP10 Task Force Project Page : http://www.naesb.org/smart_grid_pap10.asp
 - NAESB ESPI Task Force Project Page : http://www.naesb.org/espi_task_force.asp
 - NAESB ESPI and PAP10 email lists: to subscribe contact Denise Rager at NAESB - drager@naesb.org
 - NAESB Green Button Portal - http://www.naesb.org/ESPI_Standards.asp
- UCAlug
 - UCAlug OpenADE Mail List: <http://www.smartgridlistserv.org/cgi/wa.exe?A0=OPENSG-OPENADE>
 - UCAlug OpenADE Meetings: tuesdays at 3:00 EST - <https://www2.gotomeeting.com/join/844935738>, 415-363-0070 #844-935-738
 - UCAlug OpenADE Green Button Issues List: <http://osgug.ucaiug.org/HelpDesk/Lists/servicerequests/GreenButton.aspx>
- EnergyOS
 - EnergyOS OpenESPI Mail List: http://groups.google.com/group/energyos_espi/subscribe?hl=en
 - EnergyOS OpenESPI Web Site: <http://www.openespi.org/>
 - EnergyOS OpenESPI Meetings: mondays at 12:00 EST - <https://www2.gotomeeting.com/join/129392235>, +1 (516) 453-0010 #129-392-235
 - EnergyOS OpenESPI GitHub: <https://github.com/energyos/OpenESPI>
 - EnergyOS OpenESPI GitHub Issues List: <https://github.com/energyos/OpenESPI/issues>
- NREL OpenEnergyInfo Green Button Apps Repository: http://en.openei.org/wiki/Main_Page
- Green Button Data Sample/Developmental Web Site: <http://www.greenbuttondata.org>

Closing: Questions & Comments