Evolving the CIP Energy Objects

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CIP Energy™ Initiative

- CIP Energy™ Initiative founded in 2010

- Optimization of Energy Usage (OEU™)
  - a family of objects and services with 3 objectives
    - Awareness of energy usage
    - Consuming energy more efficiently
    - Procuring energy at the lowest cost

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CIP Energy™ Initiative

- CIP Energy
  - allows systems to monitor energy usage and manage energy for efficient energy consumption through dynamic control of energy state and analysis of energy information

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- ODVA Energy Applications Special Interest Group (SIG) formed 2010

The

hard work

began

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Past Publications

- Optimization of Energy Usage (OEU™) - ODVA, 2015, ODVA, C. Whitehead
  - https://www.odva.org/library…/optimization-of-**energy**-usage-oeu/
- "A day of production … a day of savings", 2015, ODVA, C. Whitehead
  - https://www.odva.org/wp…/2015_ODVA_Conference_OEU_FINAL.pdf
- CIP Energy Profiles, 2014, ODVA, (Morgan, Blair)
  - https://www.odva.org/…/2014_ODVA_Conference_Morgan_Blair_**Energy**_Profiles_FINAL.pdf
- Optimization of Energy Usage, PUB00246R2, 2012, ODVA
  - https://www.odva.org/…/PUB00246R2_ODVA-Optimization-of-**Energy**-Usage_EN.pdf
- Extracting Energy Date from MODBUS Devices Using CIP, 2012, ODVA, Blair
  - https://www.odva.org/…/2012_ODVA_Conference_Blair_FINAL_PPT.pdf
- A Technical Approach to Optimization of Energy Usage (OEU™), 2012, ODVA, (Whitehead, Crowley)
  - https://www.odva.org/library_proceedings/a-technical-approach-to-optimization-of-energy-usage-oeu/

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Initial ODVA Energy Applications SIG activity

- Created three CIP Energy Objects:
  - Base Energy Object
  - Electrical Energy Object
  - Non-Electrical Energy Object
- Added two supervisory CIP Power Objects
  - Power Management Object
  - Power Curtailment Object
- Form the basis for Optimization of Energy Usage (OEU™)

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Brief Explanation of the Energy Objects

- Base Energy Object:
  - Allows devices to report their energy usage in a standardize way using kWh
- Electrical Energy Object:
  - Reports a variety of electrical measurements
    - Voltage, current, power factor, frequency, etc.
    - Such as used in a meter or power monitor
  - Is subordinate to the Base Energy Object
- Non-Electrical Energy Object
  - Reports the usage of energy resources
    - Natural gas, steam, fuel oil, hot water, chilled water, etc.
    - In the resource's native energy unit – therms, pounds, galllons, BTU, joules, etc.
  - Also subordinate to the Base Energy Object

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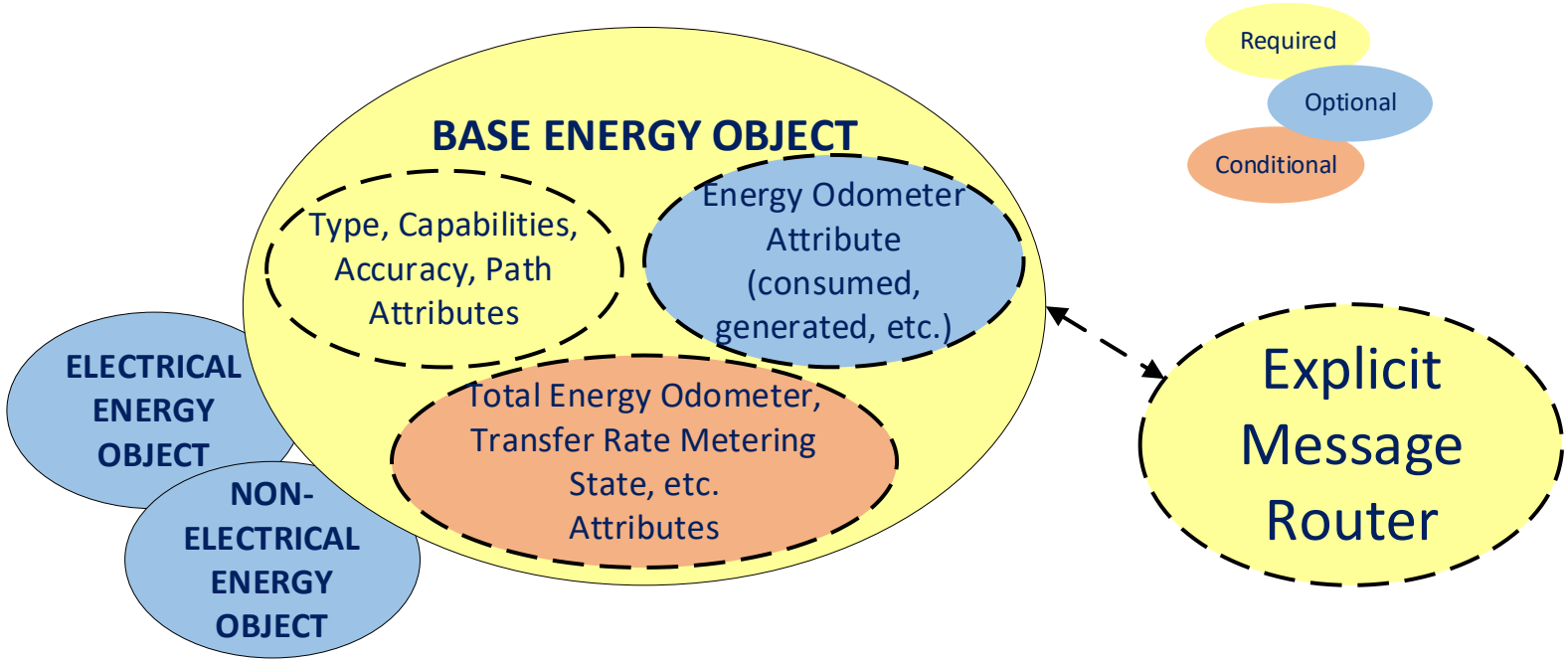
Brief Explanation of the Energy Objects



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Brief Explanation of the Power Objects

- Power Management Object:
  - Standardized interface for devices and systems to enter low-power modes
  - During periods of need; such as lunch, shift change, weekends or other idle periods
  - Devices reduce energy usage to predefined modes (paused, sleep, wake-up, etc.), in expressed notification times
- Power Curtailment Object:
  - Creates predefined curtailment levels to reduce power in devices and systems
  - Here the energy management application requests a desired power level instead of a pause in energy usage
- Together:
  - Service an energy management application client
  - Provide a child/parent energy management cascading control

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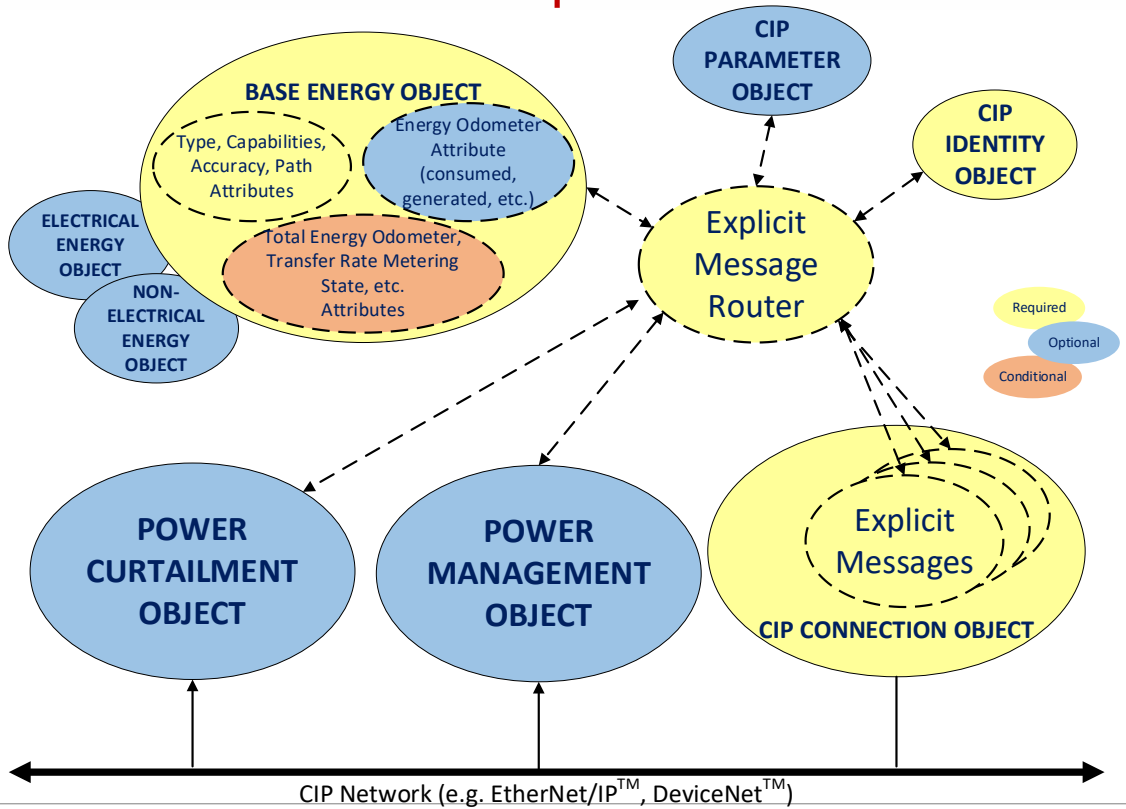
Brief Explanation of the Power Objects



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Dark Ages

- Everything halted in 2016, we parked the car and turned off the lights

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The Renaissance

- Now is the time to restart Optimization of Energy Usage(OEU) in ODVA
  - Changes in the market, the stronger concern over energy usage and management support the need for a restart
- The Global Energy Management System Market currently worth $55.2 billion is expected to grow to $208.4 billion by 2032.*
  - Compound Annual Growth Rate (CAGR) of 14.6%

*Research by market.us

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The Renaissance

- Customer driven reasons for a restart:
  - Ease of integration into their energy savings strategies
  - Pressure to reduce Global GreenHouse Gases (GHG) emissions
  - Reduced cost of implementation with a standardize approach
  - Can use a multi-vendor solution (not locked to a single vendor)
  - Higher Return On Investment (ROI) available now
- ODVA is a founding member of the Power Consumption Management Group
  - Joint Consortium with OPC Foundation, VDMA, and PI
  - An OPC United Architecture (OPC UA) Power Consumption Management specification will be written
    - With the goal: “to harmonize and standardize energy consumption information on the shop floor”

https://www.odva.org/news/joint-consortium-standardizes-common-power-consumption-management-for-the-shop-floor/

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The Renaissance

- Net-Zero Carbon emissions!
  - The World Economic Forum is driving to have net-zero carbon emission in all markets.
  - “With industry responsible for 30% of global CO2 emissions, industrial clusters will be a critical player in accelerating the path towards net zero.”

https://initiatives.weforum.org/transitioning-industrial-clusters/home

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The Evolution Process

- It is time to update and evolve the ODVA Energy Applications SIG
  - ODVA members need to reengage
    - Must be a multiple member effort, cannot be just 1 or 2 companies
    - Will need to attend regular meetings
  - Time to renew the work on the Energy/Power Objects
    - Complete the Power Management Object CIP-SE with needed enhancements
    - Update the Power Curtailment Object for modernization and alignments
    - Revisit the three Energy Objects to provide needed updates
    - Rename the Power Objects to match the names of the Energy Objects
    - ODVA has begun to work with OPC F and other associations on energy management
      - The Energy and Power Objects must align to changes and conventions of joint consortium, the Power Consumption Management Group
    - Re-establish the state-of-the-art behavior of the CIP Energy/Power Objects

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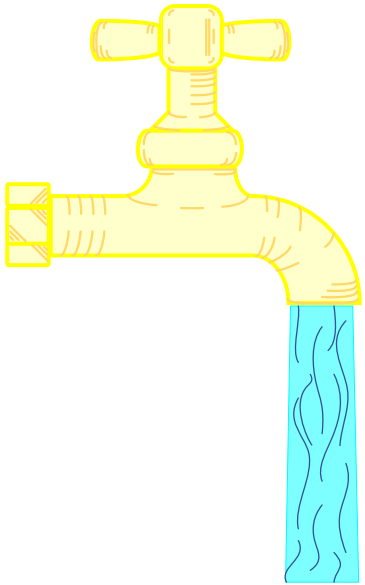
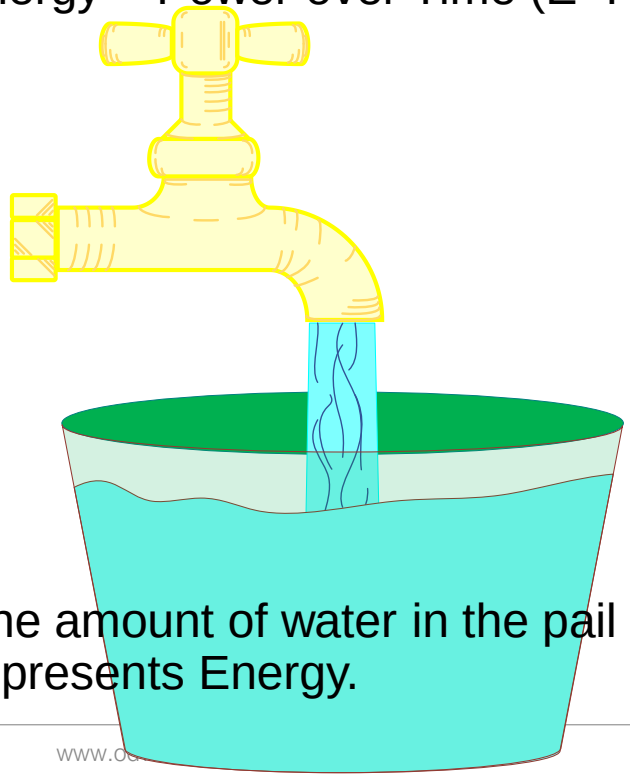
A Science Interlude

- Power = Work over Time (P=W/t)



- The rate at which the water leaves the spout represents Power.

- Energy = Power over Time (E=P/t)



- The amount of water in the pail represents Energy.

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The Evolution Process

- After the reengagement of ODVA Energy Application SIG members
- The easiest change is to align the naming of the Power Objects to Energy Objects.
  - Provide consistent naming for all CIP Energy Initiative objects
  - The Power Curtailment Object and Power Management Object handle both power and energy;
    - Energy includes Power
    - Therefore, energy in the title is more accurate
    - Customers are more interested in the Pail than the just the flowing water
  - Change to Energy Curtailment Object and Energy Management Object

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The Evolution Process (The Real Work)

- Complete CIPSE-0243-008 Power Management Update
  - Finish the rewrite of this object to include:
    - Updating the cascade capability (improve the Parent/Child relationship handling)
    - Change, correct, and provide additional Instance Attributes
    - Ensure the currently defined energy-related states are still accurate
      - Validate the current requested changes
    - Correct the Ownership functionality
  - Add updates to match information from the OPC UA Power Consumption Management specification
  - Change the name to the Energy Management Object
    - The Class Code would remain the same – 53 Hex

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The Evolution Process (The Real Work)

- Write a new CIPSE for Power Curtailment Object Update
  - Add updates to match information from the OPC UA Power Consumption Management specification
  - Change the name to the Energy Curtailment Object
    - The Class Code would remain the same – 5C Hex

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The Evolution Process (The Real Work)

- Process new specification enhancements for the Base Energy, Electrical Energy, Non-Electrical Energy Objects
  - All use Odometer data type for tracking energy data
    - makes sense for visual display
    - inefficient data type for internally managing energy data.
    - integer would be a better choice
  - Correct the rollover behavior in all the objects
  - Add updates to match information from the OPC UA Power Consumption Management specification
  - Include new features to reestablish state-of-the-art behavior

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Conclusion

- The time is right for evolving OEU in ODVA
  - Market growth, customer needs, government mandates (GHG, carbon reduction) support a restart
- Other organizations have started the development
  - ODVA needs to stay aligned and add further market value
- It takes a village, an ODVA Village
  - This evolution must be a multi-member effort
- The work is well defined and partially completed
  - We know how to get there from here

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Questions?

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Thank You

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