Web Services that Foster Innovation in Buildings Energy Analysis Tools

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Evolution of Energy Software Tools
Hand Calculations

UAΔT + infiltration + solar
Mainframes

• Room-sized computers; painful input; no GUI; massive output
  – very narrow user base
  – runtime measured in hours
Lookups & Nomographs
Desktop Machines

- Disk-based
  - hundreds or thousands of users
  - runtime measured in minutes

195kb capacity
Web-based

• Cloud-hosted applications with friendly GUIs
  – millions of users (including DIY)
  – runtime measured in seconds
At Least 400 Tools Now Exist

• Vibrant differentiation, but also a lot of redundancy in effort/cost (and inconsistency in results)
Software as a Service → APIs
What is an API, anyway?

APIs are protocols through which the host computer and a client computer communicate and exchange data, leaving the client free to decide how to gather input data from its customers and how to present them with results.
## APIs

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<th>Pros</th>
<th>Cons</th>
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<td>• Speeds and simplifies syndication of models and databases</td>
<td>• Requires web-infrastructure</td>
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<td>• Radically lowers the cost of entry for private software developers</td>
<td>• Derivative tools all depend on single API provider</td>
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<td>• Developers can focus more on front-end</td>
<td>• Initial development is slower; user support</td>
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<td>• Enables more rapid innovation and differentiation of tools</td>
<td>• Developers need special skills and to be able to understand and adapt to outside service and support paradigm</td>
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<td>• Facilitates more internal consistency in methodology and data across proliferation of tools</td>
<td>• Requires very explicit documentation for third-party developers</td>
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<td>• Ameliorates stereotypical separation between “public” and “private” tools</td>
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LBNL APIs and Early Implementations

- **Home Energy Saver (Consumer & Pro versions)**
  - Whole-building simulation, including hourly HVAC (DOE2.1E)
  - Models/algorithms for all other end uses
  - Flexibility to model utilization and other behavioral variables
  - Defaults for every input
  - Whole building and end-use results: Energy / Costs / Emissions
  - Upgrade recommendations

- **Home Energy Scoring Tool**
  - HES Operational approach => Asset rating approach
  - Answers required (no user defaults)
  - Creates PDF label and upgrades list

- **EnergyIQ**
  - Non-residential energy benchmarking
  - 62 building types
  - 85 features/characteristics
  - 9 metrics (energy / costs/ emissions)
  - 4 chart types
  - Recommendations
  - Portfolio Manager import
API Deployment

• About 300 entities have expressed interest in these APIs
• Within the first year, more than 50 entities (public and private) became users.
• Some launched products, others still working, others fell away
• More runs are generated via our APIs now than via our own GUIs
Microsoft hohm

- Who: Microsoft
- What: Consumer education
Mobile App: iViro

• Who: Envirolytics

• What: Consumer education & lead generator
  – Uses other apps to facilitate inputs
    • Compass for orientation
    • Camera + geometry for estimating wall heights and areas.
Consumer Tool

- **Who:** WattzOn
- **What:** Consumer education & lead generator
Home Inspector Tool

- Who: InterNACHI
- What: Home rating and tool for members
Home Energy Scoring Tool:
iOS (iPhone, iPad) Android (Phone, Galaxy Tab)

- **Who:** MNCEE
- **What:** Scores plus software for project mg’t
DOE WAP - MulTEA

- Who: ORNL
- What: Official tool for weatherization audits
MyHome-EQ

- **Who:** CNT spinoff
- **What:** Home rating + lead generation
CoolCalifornia

• Who: California Air Resources Board
• What: Carbon calculators for homes and businesses
Future Directions

• Embedded *inside* devices (e.g. TSTATS)
• EMS integration
• Mash
• Etc...
Take-aways

• APIs are powerful new technologies for energy modeling
• Public R&D investment is enabling private-sector innovation in user-interfaces and delivery, eliminating bottlenecks, and (potentially) supporting back-end standardization
• The public sector is a good place for developing APIs
  – There’s no money in it
  – Innovative mode of technology transfer
  – Non-proprietary (no particular product or fuel orientation)
  – Staying power
• Not for the faint of heart
  – Development is grueling
  – Users are demanding
  – Stakes are high (others depend on your service)
• Users are (understandably) fickle
https://developers.buildingsapi.lbl.gov/

Home Energy Saver
The Home Energy Saver tool suite and APIs—the culmination of a decade and a half of development by the U.S. Department of Energy’s Lawrence Berkeley National Laboratory—provides web-based residential energy calculators for consumers and professionals. These tools provide customized estimates of residential energy use, energy bills, and greenhouse-gas emissions, based on information provided by the user. The service identifies and ranks potential energy-saving strategies for any home.

Sign up to our web service and use our APIs to power a user interface of your own design.

Scoring Tool
The Home Energy Scoring Tool provides an “asset rating” of a home’s energy use under standardized occupancy and operational conditions. Qualified assessors can gather the information needed to assess a home in one short site visit. The tool underpins the U.S. Department of Energy’s new Home Energy Score Program, designed to label homes across the country. With these APIs, approved software developers can generate home energy scores as a stand-alone service or as an add-on to a home inspection or comprehensive energy assessment.

Sign up to our web service and use our APIs to power a user interface of your own design.

EnergyIQ
The EnergyIQ action-oriented benchmarking system enables users to compare the energy performance of a non-residential building to a user-defined peer group, and generates an opportunity assessment with general recommendations on how to save energy and money, while reducing greenhouse-gas emissions.

Release History
Licensing information

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