TODAY’S DISCUSSION

• JOBS EVSE 1.0 overview
• Methodology
• Default data and assumptions
• Illustrative scenario
• Next steps

https://jobsfc.es.anl.gov/index.php
JOBS EVSE TAKES A HOLISTIC APPROACH TO MODELING ECONOMIC IMPACTS
JOBS EVSE 1.0

• Excel-based tool estimates economic impact for **user-defined scenarios:**
  - Geographic region of interest
  - Number, capacity of stations
  - Utilization, electricity price, etc.
  - Default values or user inputs

• **Deploying EV chargers:**
  - Manufacturing, transporting, installing equipment
  - Pre-construction and construction
  - Station operation & revenue

• Expenditures are translated into **dollar flows among industries** using USDOC RIMS2 input-output model
METHODOLOGY
INPUT-OUTPUT MODELING

• Output (goods and services) of any industry i is input to other industries j and to industry i itself
• Industry i output depends on input requirements to all n industries
• Output of many industries k are inputs to industry i

\[ K_1, k_2 \ldots k_n \]
SCAPE AND DEFINITIONS

- **Job** – One year of work, full- or part-time, for one person
- **Supply Chain Job** – Directly involved in producing, shipping, installing, constructing and operating stations and in supplying inputs to those activities. Includes “direct” and “indirect”.
- **Induced Job** – Created by re-spending of wages/incomes by supply-chain job-holders
- **Earnings** – Wages and proprietor’s income
- **Economic Output** – Gross economic activity associated with expenditure flows across the economy
- **Multipliers**
SCOPE AND DEFINITIONS (CONT’D)

▪ **Station development expenditures:**
  - Up-Front Permitting
  - Engineering & Design
  - Site Preparation & Construction (including trenching/boring)
  - Electrical Infrastructure & Make Ready
  - Project Contingency
  - Uninstalled equipment ($/unit) for cable cooling, chargers, conduit and cables, on-site electrical storage, switchgear, transformers, safety & traffic control, and miscellaneous equipment
  - Shipping
  - Equipment Installation

▪ **Station operation expenditures:**
  - Electricity cost to station
  - Administrative expense
  - Maintenance expense
  - Warrantees
  - Data and networking fees

▪ **Station operation revenue:**
  - Retail sales
  - Advertising
  - Access fees

▪ **Local shares:**
  - For each type of station development expenditure (excluding equipment)
  - For producing, shipping and installing each type of equipment
DEFAULT DATA AND ASSUMPTIONS
Installers/developers: EV Launchpad, Frances Energy, Solar Alternatives
Network providers: Blink, Greenspot, EVGo, ChargePoint
Utilities: W. Farmers’ Generation & Transmission Co-op, National Grid, Avista, NH Co-Op, Eversource
Eqpt. manufacturers: ABB, Eaton, Freewire
Site plans: Foothill (Burns McDonnell), MGE East Washington Charging Hub, Argonne Smart Energy Plaza
Clean Cities Coalitions: TCC, C-OKCC, CC-CNY, SSCC, GRCC, NCCC, CDCCC, GSCC, ECC, MCCC, GLICC, LCF
Analysts/researchers: ICCT, RMI, INL, NREL, ICF/Fuel Institute, Atlas
JOBS EVSE CONSIDERS ENTIRE SUPPLY CHAIN

......As well as recurring expenditures like electricity, network & data fees, revenues, warrantees, O&M, administrative and access fees
ON-SITE EXPENDITURES INCLUDE BOTH EVSE AND OTHER DEVELOPMENT AND OPERATING EXPENSES

*Including engineering and design, installation, shipping, permitting, etc.*
• Existing service assumed unable to handle increased load. Transformer upgrade to 90% of charger maximum power.
• No future proofing assumed in default case. User input required.
• 3 chargers (2 ports/cords per charger).
• Trenching/boring from transformer to cabinet to chargers. Default assumes 75 ft at $80/ft.
• ADA compliance, retractable cords, signage, bollards/curbs and striping/sidewalks.
- Existing service assumed unable to handle increased load. Transformer upgrade to 90% of charger maximum power.
- No future proofing assumed in default case. User input required.
- 3 chargers (2 ports/cords per charger).
- Trenching/boring from transformer to cabinet to chargers. Default assumes 75 ft at $80/ft.
- ADA compliance, retractable cords, signage, bollards/curbs and striping/sidewalks.

- Existing service assumed unable to handle increased load. Transformer upgrade to 90% of maximum charger power.
- No future proofing assumed in default case. User input required.
- 3 chargers (1 port/cord per charger).
- Trenching/boring varies by site. Default assumes 75 ft at $80/ft.
- ADA compliance, retractable cords, signage, bollards/curbs and striping/sidewalks.
# JOBS EVSE 1.0 TOOL

## START PAGE

**DIRECTIONS:** This page is the first page to be completed for each scenario. On this page choose the geographic region for analysis, and scenario type for the economic impact study. Choosing an economic impact scenario in Rows 14 through 16 will highlight the sheets that need to be completed. You can navigate to those sheets using the navigation buttons in columns E and F, or by clicking on the relevant sheet in the workbook. Additional information about using JOBS EV is available on the JOBS EV 'User Guide' and 'Default Values & Definitions' sheet.

### Please choose Region and Economic Impact Scenario below

<table>
<thead>
<tr>
<th>Choose Region</th>
<th>Select Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select State or Region</td>
<td>USA-National</td>
<td>Using the drop down menu, choose National, Census Region, or State. This will be the region for analysis for all calculations. Please refer to the 'User Guide' sheet for a breakdown of states in each Census Division.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Choose Economic Impact Scenario</th>
<th>GO TO</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Station Development ONLY (incl. construction, equipment, etc.)</td>
<td>Station Development-INPUTS</td>
</tr>
<tr>
<td>Stations in Operation ONLY (EVSE station sales and expenses)</td>
<td>Station in Operation-INPUTS</td>
</tr>
<tr>
<td>Station Development &amp; Stations in Operation</td>
<td>Station Development-INPUTS</td>
</tr>
</tbody>
</table>

Go to the 'Station Development-INPUTS' sheet. Then go to the 'Stations in Operation-INPUTS' sheet.
**STATION DEVELOPMENT - INPUTS**

| DIRECTIONS: This sheet is for specifying expenses for the development and construction of natural gas fuel stations including equipment, piping, construction and installation, and the amount of expenditures being spent in the selected regions. First specify the station type and size in Step 1. Next in Step 2, indicate how many new stations are completed each year. In Step 3, enter the average monthly sales per station. All values in white cells. Cells with other formatting contain formulas which should not be changed. To reset all values on this sheet, use the "Clear All User-Specified Values" button below. |

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### GENERAL STATION DEVELOPMENT

#### Step 1 - EV Station Type and Station Capacity

- **Station Type**
  - Select station type: Level 2
  - Default: Dropdown menu
- **Average Usage - Sessions/Month**
  - Value: 80
- **Average Usage - kWh/Session**
  - Value: 10.0
- **Potential annual sales per station (kWh/station/year)**
  - Value: 654

#### Step 2 - Number of New Stations Completed Each Year

- **Year**
  - 2020
  - 2021
  - 2022
  - 2023
  - 2024
  - 2025
  - 2026
  - 2027
  - 2028
  - 2029
  - 2030

**The total per station development expenses**

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Development Expenses</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020</td>
<td>$654.00</td>
</tr>
<tr>
<td>2021</td>
<td>$654.00</td>
</tr>
<tr>
<td>2022</td>
<td>$654.00</td>
</tr>
<tr>
<td>2023</td>
<td>$654.00</td>
</tr>
<tr>
<td>2024</td>
<td>$654.00</td>
</tr>
<tr>
<td>2025</td>
<td>$654.00</td>
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<td>$654.00</td>
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<td>2027</td>
<td>$654.00</td>
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<tr>
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<td>$654.00</td>
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<tr>
<td>2029</td>
<td>$654.00</td>
</tr>
<tr>
<td>2030</td>
<td>$654.00</td>
</tr>
</tbody>
</table>

All dollar values are in 2020$. All user-specified entry.

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### STATIONS IN OPERATION - INPUTS

| DIRECTIONS: This sheet is for specifying expenses related to station operation and fuel sales, including the amount of expenditures being spent in the selected regions. First specify the station type and size in Step 1. If it has not already been specified on the "Station Development - Inputs" sheet, in Step 2, indicate the number of stations in operation each year. In the remainder of the sheet, specify values for each item as defaults. Users should only enter any change values in white cells. Cells with other formatting contain formulas which should not be changed. To reset all values on this sheet, use the "Clear All User-Specified Values" button below. |

---

#### Step 1 - EV Station Type and Station Capacity

- **Select station type**
  - Default: Dropdown menu
- **Average Usage - Sessions/Month**
  - Value: 80
- **Average Usage - kWh/Session**
  - Value: 10.0
- **Potential annual sales per station (kWh/station/year)**
  - Value: 654

#### Step 2 - Stations in Operation

- **Year**
  - 2020
  - 2021
  - 2022
  - 2023
  - 2024
  - 2025
  - 2026
  - 2027
  - 2028
  - 2029
  - 2030

**The total number of stations in operation by year**

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Stations</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020</td>
<td>20</td>
</tr>
<tr>
<td>2021</td>
<td>20</td>
</tr>
<tr>
<td>2022</td>
<td>20</td>
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<td>2023</td>
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</tr>
<tr>
<td>2029</td>
<td>20</td>
</tr>
<tr>
<td>2030</td>
<td>20</td>
</tr>
</tbody>
</table>

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### STATION DEVELOPMENT RELATED

**Step 3 - Station Equipment Expenses (installed and Quantity)**

- **Organization of FES (e.g., End-User and Bulk)**
- **Cost Values (e.g., Quantity):**

**Step 4 - Average Monthly Sales per Station**

- **Number of months:** 12
- **Average monthly sales per station:**
  - 2020: $654.00
  - 2021: $654.00
  - 2022: $654.00
  - 2023: $654.00
  - 2024: $654.00
  - 2025: $654.00
  - 2026: $654.00
  - 2027: $654.00
  - 2028: $654.00
  - 2029: $654.00
  - 2030: $654.00
ILLUSTRATIVE SCENARIO: VIRGINIA ELECTRICITY PLAN (DRAFT)
VA ELECTRIFICATION TARGETS/ASSUMPTIONS

- 4 million home L2 plugs by 2040
- 1 million workplace L2 plugs by 2040
- 580,000 public L2 plugs by 2040
- 65,000 public DCFC plugs by 2040
- 2 plugs/ports per charger
- 2 chargers per work or public station
- 33% of targets by 2030
- On-site electric storage for DCFCs
- All components made in USA, outside VA

Plugs In Place by 2030

<table>
<thead>
<tr>
<th></th>
<th>Level 2</th>
<th>DCFC</th>
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</thead>
<tbody>
<tr>
<td>Workplace</td>
<td>303,860</td>
<td></td>
</tr>
<tr>
<td>Public</td>
<td>193,200</td>
<td>21,613</td>
</tr>
<tr>
<td>Home</td>
<td>1,333,333</td>
<td></td>
</tr>
</tbody>
</table>
VA STATION DEVELOPMENT EXPENDITURES

**Level 2 Stations**
- Engineering, 12%
- Construction, 24%
- Installation, 12%
- Shipping, 1%
- Permitting, 8%
- Charger, 33%
- Cable Cooling, 0%
- Switchgear/panels, 0%
- Misc. (mounting hardware, etc.), 3%
- Transformers, 0%
- On-site Electrical Storage, 0%
- Safety & Traffic Control, 3%
- Cord management, 2%

**DCFC Stations**
- Engineering, 15%
- Construction, 6%
- Installation, ...
- Shipping, 2%
- Transformer, 3%
- On-site Electrical Storage, 28%
- Permitting, 10%
- Charger, 19%
## VA PUBLIC STATION OPERATION EXPENDITURES

### Public Stations

#### Monthly Revenues

<table>
<thead>
<tr>
<th>Type</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retail sales</td>
<td>$1,200.00</td>
</tr>
<tr>
<td>Ad sales</td>
<td>$1,400.00</td>
</tr>
<tr>
<td>Access Fees</td>
<td>$0.00</td>
</tr>
</tbody>
</table>

#### Monthly Expenses

<table>
<thead>
<tr>
<th>Type</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity*</td>
<td>varies</td>
</tr>
<tr>
<td>Administration</td>
<td>$10.00</td>
</tr>
<tr>
<td>Maintenance</td>
<td>$5.00</td>
</tr>
<tr>
<td>Warranty</td>
<td>$10.00</td>
</tr>
<tr>
<td>Data &amp; Networking</td>
<td>$30.00</td>
</tr>
</tbody>
</table>

*Utilization dependent ($0.33/kWh).

---

### Electricity (gWh/year)

![Graph showing electricity consumption from 2022 to 2030](electricity_chart.png)
VA RESULTS

Supply Chain Jobs – Directly involved in producing, shipping, installing, constructing and operating stations and in supplying inputs to those activities

Induced Jobs – Associated with re-spending of wages/incomes by supply-chain job-holders

Total employment:
• By charger type & location (top graph)
• By development vs. operation (bottom graph)

Job Creation:
• ~14,000 jobs/year from station development
• ~0.2 jobs/yr per cumulative charger in operation
• 274,000–291,000 jobs created over 10 years
• ~40,000 jobs in 2030

Total Employment Associated with VA Electrification Program
NEXT STEPS
JOBS EVSE: FY 22

• Sensitivity analysis
• Posting version 1.0, tutorial and presentation materials to Argonne JOBS MODELS website with link from AFDC “tools” page
• JOBS EVSE 1.1:
  – Higher power and heterogeneous charger types
  – More granular defaults
  – Other revenue sources (e.g., parking, vehicle leasing/rental, V2G, TNC hubs, etc.)
• JOBS EV 1.0:
  – EV manufacturing
  – Battery supply chain
  – Upgraded platform
THANK YOU!

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QUESTIONS?

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