Next Generation Plug N Play Substation Skids
Future of TS - Portable Power Solutions

High voltage Portable Power solutions up to 420kV

<table>
<thead>
<tr>
<th>Skids</th>
<th>HV E-Houses</th>
<th>Mobile substations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outdoor or Indoor</td>
<td>For extreme conditions</td>
<td>Transportable any time</td>
</tr>
</tbody>
</table>
Situations which require a reliable solution for power supply within short term...

<table>
<thead>
<tr>
<th>Emergency power supply</th>
<th>Fast grid expansion</th>
<th>Maintenance on existing substations</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ Quick restore of power supply after any unexpected emergency, such as flood, fire</td>
<td>▪ Temporary compensation of any <strong>delay in construction</strong> of new conventional substation.</td>
<td>▪ Interim replacement of existing substation during <strong>planned maintenance</strong> or repair.</td>
</tr>
<tr>
<td>disaster, earthquake or other natural disasters.</td>
<td>▪ Bypass the lengthy <strong>approval process</strong> related to the land occupation request,</td>
<td>▪ Recovery of power supply after <strong>unplanned break down</strong> of existing substation.</td>
</tr>
<tr>
<td>▪ Add extra capacity and stabilize the grid during the <strong>peak load of power supply</strong>,</td>
<td>being a temporary and movable solution.</td>
<td>▪ Ensure <strong>uninterrupted</strong> power supply during replacement or repair of broken equipment.</td>
</tr>
<tr>
<td>(e.g. in summer or in the peak season of some touristic area).</td>
<td>▪ Provide <strong>Primary distribution</strong> in isolated area.</td>
<td></td>
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<tr>
<td>▪ Backup during major events like exhibitions or summits.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Mobile Substations are the most effective and efficient solution to quickly and reliably ensure plug-and-play power supply.**
For whom a mobile solution can be the answer to the individual critical situation?

Grid Operators:
- TSO / DSO
- ...challenged by emergency grid restoration, e.g. after natural disasters
- ...requiring continues operation of substation during maintenance and rehabilitation
- ...facing rapid grid extension and requiring temporary plug & play solution

Power Generation:
- Power Plants
- Wind Farms
- ...facing fast plant extensions
- ...challenged by unplanned maintenance of step-up substation after damage

Industry:
- Oil&Gas
- Mining
- Production
- ...need a reliable emergency back-up to secure their operation
- ...facing remote or hostile environments
- ...facing temporary or expandable power supply needs
High integration and easy cable connections reduce the commissioning within, up to 16 hrs.

**Fully integrated & tested**
- All components are delivered **completely assembled and routine tested** in factory.
- Transformer already **fully assembled** (terminations, conservator, cooling devices) and **oil filled**.
- HV side can be connected either by overhead lines or cable; cable support is available on composite apparatus module (easy to connect).
- **Fast plug-in type terminals** for cable connections of SF6 GIS.
- Optional **power-driven cable drum** and 10-35kV flexible single phase power cable.
- Pre-testing of the complete substation before leaving the factory to ensure perfect interconnections.

**Fast & Easy Commissioning**
- **Commissioning time within hours** (e.g. connect cables between trailers and grid, verify rating of the measuring and protection equipment)
- **Plug and play connections** available on demand between the transformer trailer and power distribution trailer
- **No repetition** of the substation testing on site.
Portable solutions are not only mobile substation

**Fit-for-your-purpose**

- **Single-lift solutions** based on
  - Steel frame with insulating panels or for outdoor
  - 20” / 40” customized container.
  - Tailor-made prefabricated metallic building

- **Modular solutions** suitable for different voltages, specific constraints (climatic & industrial conditions, limited visual impact).

- Embedded **technical lots** (HVAC, lighting, Fire & Gas protection, …)

- **Very limited Civil Works**

- **Preassembled and pretested.**
  Delivered on site in a single or multiple modules ready to be commissioned.

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**E-house Solution**

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**Skid-mounted Solution**
Examples of realization: Mobile Substation for rapid grid extension

<table>
<thead>
<tr>
<th>Rating</th>
<th>110/10.5kV - 20MVA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Country</td>
<td>China</td>
</tr>
<tr>
<td>Requirement</td>
<td>Rapid Grid Extension</td>
</tr>
</tbody>
</table>

...this solution is specifically designed to cope with challenging road limits. This is realized e.g. by using intelligent suspension, hydraulic shock absorbers and individual steering wheels.
Examples of realization:
Mobile Substation for a coal mine application

<table>
<thead>
<tr>
<th>Rating</th>
<th>66/10.5 kV - 20MVA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Country</td>
<td>China</td>
</tr>
<tr>
<td>Requirement</td>
<td>Compactness</td>
</tr>
</tbody>
</table>

...compact plug&play solution with high reliability and low maintenance requirements to cope with the harsh environment of a coal mine.
Examples of realization: Mobile substation as emergency back-up

<table>
<thead>
<tr>
<th>Rating</th>
<th>220/60-30kV – 40MVA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Country</td>
<td>Algeria</td>
</tr>
<tr>
<td>Requirement</td>
<td>Grid Restoration</td>
</tr>
</tbody>
</table>

...the 220kV /60kV mobile substations is used as emergency grid reinforcement fto be deployed to the weakest part of the network.
Examples of realization: Mobile substation for fast track generation project

Rating | 420kV
Country | Algeria
Requirement | Fast track project

...this 420kV mobile substations is used as a fast track substation for the grid connection of a power plant
Examples of realization:
Portable skid mounted solution for mining

<table>
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<tr>
<th>Rating</th>
<th>145kV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Country</td>
<td>South Africa</td>
</tr>
<tr>
<td>Requirement</td>
<td>Reduce installation efforts</td>
</tr>
</tbody>
</table>

...a mining company was looking for portable grid connection solutions that can easily be relocated in case of extraction work site reconfiguration, extension or de-mobilization.
Examples of realization: E-House solution for industrial production

<table>
<thead>
<tr>
<th>Rating</th>
<th>145kV – 2x 55MVA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Country</td>
<td>Ukraine</td>
</tr>
<tr>
<td>Requirement</td>
<td>Reduce installation efforts</td>
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</tbody>
</table>

...this gas treatment unit needs compact plug and play substation fully tested and pre-commissioned in factory to minimize site works and operational down time
Examples of realization:
E-house solution for grid maintenance & extension

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<thead>
<tr>
<th>Rating</th>
<th>110kV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Country</td>
<td>Belgium</td>
</tr>
<tr>
<td>Requirement</td>
<td>Compactness</td>
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...5 x110kV bay in a 40’ container used for bypassing existing substations during extension / upgrading works in a urban environment. Easy unloading thanks to built-in jacking system.
The Canadian Solution
Mobile Substation
CANADIAN FEATURES

- Built in Canada to comply with Customer specifications and local regulations.
- Standardized Siemens transformer design, sourced from Siemens global manufacturing facilities.
- Customized design with GIS / AIS solution, sourced from Siemens global manufacturing facilities.
- Optimized design, while ensuring minimal losses.
- 3d Design technology is used to avoid integration errors.
- Trailers built for maximum maneuverability throughout the year.
- Localized presence of Siemens service personnel to support After Sales.
Mobile Substation

A typical 25MVA, 138kV solution designed by Siemens Canada for a local customer with AIS Breaker
Mobile Substation
3d Design Method used to avoid Errors
Mobile Substation
Canadian Project  Example
Mobile Substation
A typical 25MVA, 138kV solution with AIS CB with connection to transformer via XLPE cable
Mobile Substation
A typical 25MVA, 138kV solution with AIS CB
Mobile Substation:
A typical 25MVA, 138kV solution with Customer preferred HV switcher and disconnect products
Mobile Transformers
A typical 30MVA, 230kV Transformer Solution for a local customer
Mobile Substation
A typical 15MVA, 138kV solution designed by Siemens Canada for a local customer with GIS Breaker
Mobile Transformers 138kV Suncor Skid Base Substations
Alberta, Canada
GIS Plug & Play
A typical 2X 10MVA, 150kV Transformer Solution Future Expansion