Injection Group Inclusion in WECC Base Cases

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What is an Injection Group?

- What is an injection group and

- How does it help if it is in a base case?

  First the "how"—a couple examples from the Northwest…

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Operations:

- You are an operations study engineer—there is an operational crisis in the Upper Columbia, and real-time dispatchers need to know how much generation can be supported. Grand Coulee and Chief Joseph have a total of nearly 60 units. Do you have time to:

  - A) Manually start counting up each Pgen value one by one?

  - B) Use an injection group to "do the math" for you?

EASY

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Planning

- You are a now a planning study engineer, assessing whether there's any more capacity for a new wind plant off the Oregon coast. Your boss asks you to balance this against your company's existing generators. Do you:

  - A) Decrement all your generators one at a time?

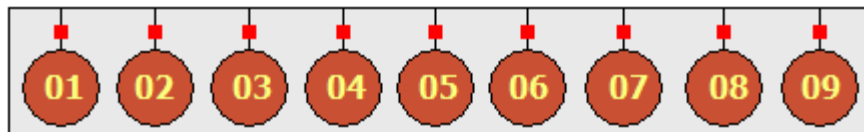 - B) Use an injection group to scale against the wind project?

EASY

WECC

Chances are...

- Your study engineer may be using injection groups.

- Your operations engineer may be using injection groups.

- Your RC may be using injection groups.

- *If not, they are working too hard!*

- Injection groups are primarily a study tool.

- Putting injection groups in base cases can help your team work smarter, not harder.

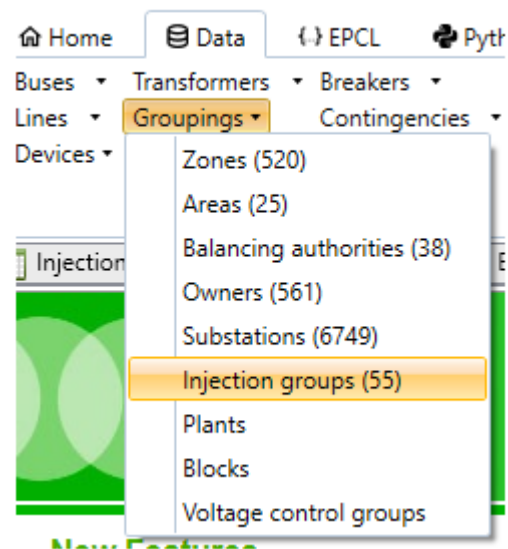<Public>

What is an injection group?

- Functionally, an injection group is a type of scalable aggregation, typically of load and gen objects

- Think of it like a box you can put around things, like a Substation

- BUT the box can also do math

  - Sum up the total (such as total generation of a plant with nine units)

  - Scale things in the box (such as a generation or load total level)
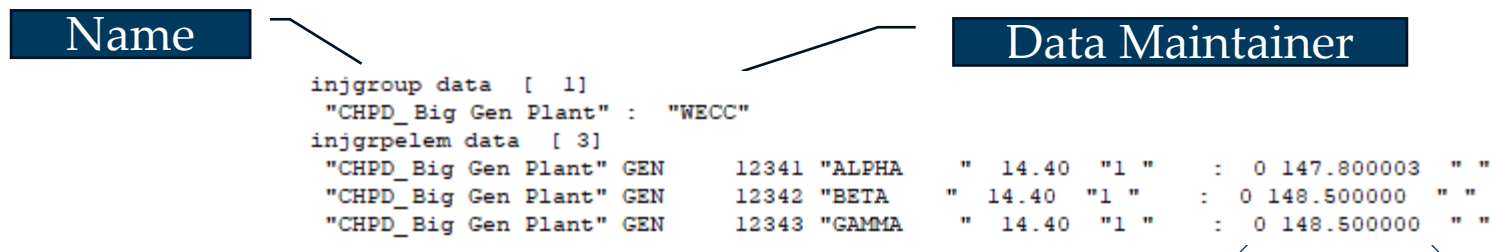
  - PowerWorld 'Tools' tab ->

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Quickly—Where to Find it in PSLF

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Quickly—What does EPC Format Look Like?

- Twp parts: the group (box) and the points (contents)

Name

Data Maintainer

```
injgroup data   [  1]
 "CHPD_Big Gen Plant" :   "WECC"
injgrpelem data  [ 3]
 "CHPD_Big Gen Plant" GEN      12341 "ALPHA    "  14.40  "1 "    :  0 147.800003  " "
 "CHPD_Big Gen Plant" GEN      12342 "BETA     "  14.40  "1 "    :  0 148.500000  " "
 "CHPD_Big Gen Plant" GEN      12343 "GAMMA    "  14.40  "1 "    :  0 148.500000  " "
```
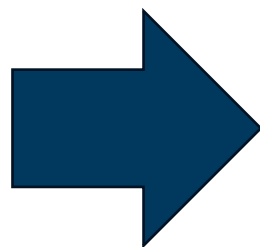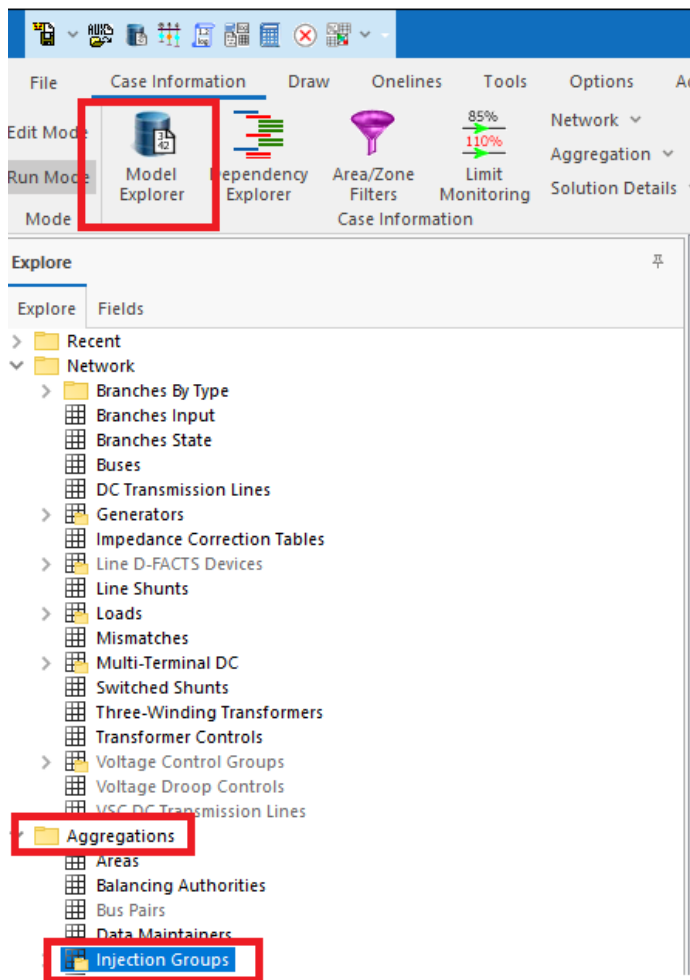
Participation point method (typically a '1' to use pmax)   Participation factor value (if used for scaling)

```
prfcalcopt  =   0 to use the user defined value of <prf>
prfcalcopt  =   1 indicates to use generator pmax as the value of prf
prfcalcopt  =   2 indicates to use generator pmax-pgen reserve as the
value
             of prf
prfcalcopt  =   3 indicates to use generator pgen-pmin reserves as the
             value of prf
prfcalcopt  =   4 indicates to use load pmax as the value of prf
prfcalcopt  =   5 indicates to use shunt qmax as the value of prf
prfcalcopt  =   6 indicates to use shunt up reserve (pmax-q) as the value
             of prf
prfcalcopt  =   7 indicates to use shunt down reserve (q-qmin) as the value
             of prf
prfcalcopt  =   8 indicates to use a given field/member from the object as
             the value of prf
prfcalcopt  =   9 indicates to use the output of a model expression as the
             value of prf
```

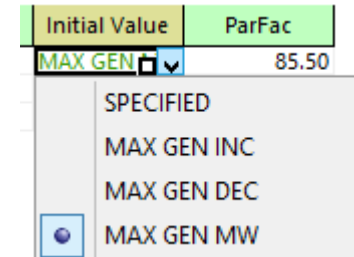<Public>

Quickly—Where to Find it in PowerWorld

Quickly—What does the AUX Format Look Like?

InjectionGroup (Name,DataMaintainer)

{

    "CHPD_Big Gen Plant"   "Chelan PUD"

}

PartPoint (GroupName,Object,AutoCalcMethod,PartFact,AutoCalc)

{

"CHPD_Big Gen Plant" "Gen '12341' '1'" "MAX GEN MW"   85.500002 "YES"

"CHPD_Big Gen Plant" "Gen '12342' '2'" "MAX GEN MW"   85.500002 "YES"

"CHPD_Big Gen Plant" "Gen '12343' '3'" "MAX GEN MW"   85.500002 "YES"

}

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PowerWorld GUI for Scaling an Injection Group

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PowerWorld Sample AUX Code for Scaling

```
// Set all scale fields to NO to avoid accidental scaling
Script
{
SetData(Bus, [BGScale], ["NO"], All);
SetData(Area, [BGScale], ["NO"], All);
SetData(Zone, [BGScale], ["NO"], All);
SetData(Owner, [BGScale], ["NO"], All);
SetData(InjectionGroup, [BGScale], ["NO"], All);
//
// Enable scaling for Rock Island Powerhouse 1 Injection group
SetData(InjectionGroup, [InjGrpName, BGScale], ["Rock Island Powerhouse I gen","YES"]);
// Scale to 60 MW
Scale(InjectionGroup, MW, [60], Bus);
// Disable scaling since complete
SetData(InjectionGroup, [InjGrpName, BGScale], ["Rock Island Powerhouse I gen","NO"]);
// Re-solve case
EnterMode (Run);
SolvePowerFlow (RECTNEWT);
}
```

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Benefits

- Base case preparation and review
- Case information and report summaries
- RAS file definitions, inputs, and actions
- Scaling *(plant, load area, Balancing Authority, resource type…)*
- One-lines
  - PowerWorld geo one-line auto-insert
- Contingencies
- Source and Sink for various analyses

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Downsides

- Through initial discussion, possibly not desired to be in WECC DPM

- Through initial discussion, consistent, non-complicated name desired

- Through initial discussion, this is **_OPTIONAL_** data; not required

  - WECC SRS considered injection groups in 2021 but recommended they be placed in WECC Base Case business practice manual (this was dropped during a leadership change at SRS, back "on the radar" as of January 2024)

- If names change, injection group *references* in displays, RAS, contingencies become unlinked (name is the invariant key); having them provided in base cases helps with consistency

- Inconsistent naming/sources requires maintenance of several datasets—inefficient; having them provided in base cases helps with consistency

- PSSE has a similar concept called "subsystem," but does not support injection groups directly

Background

- Can injection groups be added to the WECC base case process, so they are in cases and consistent if a data submitter wants?

- Where are things at?

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Conversation was Started Back in 2021

SRS Chair Report to
SRS

October 2021

Background

- SRS chair recommended injection group naming be an item in the WECC Business Practices document:

Best Practices

- Injection group naming convention
  - Software specific recommendations
- WECC Business Practices Document

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Naming—WECC RAS Guidance

- Injection group naming thought to be described in the WECC DPM RAS guidance under "All models…" identifier

Remedial Action Scheme Data

Remedial Action Scheme (RAS) data must be shared with WECC and WECC must securely store the information separate from the interconnection-wide cases.

The following approach should be taken when providing RAS data:

- All models should be provided upon request by PCS in their preferred format until the WECC common format is available in the provider's preferred software.
- RAS models should be provided if the affected elements are modeled in the case.
- All models should identify the data owner by naming the models with the member system abbreviation and an underscore at the front. (e.g., "member system abbreviation_descriptive model name")
- RAS models must be provided for all operations base cases. These are denoted by an "-OP" in the base case compilation schedule. New models must be provided when the RAS are placed in use by the Operations department of each member, while existing models need only be updated when changes occur. PCS must notify WECC staff if any already provided models are no longer online and should be removed.
- RAS data will be made available on the WECC website. It will only be accessible to those users who are logged in and authorized to access it.

Background

- [Base Case Business Practices](#) last updated July '21

Thus: Injection groups have not been updated in the Base Case Business Practices

Base Case Business Practices
System Review Subcommittee
July 27, 2021

Purpose

The intent of this document, in conjunction with the WECC Data Preparation Manual and Base Case Compilation Schedule, is to document the procedures and processes of base case creation. This document details to the processes and procedures for submitting data, what data to submit, and how to use the various resources to improve base case data quality.

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Discussion Today

- Injection groups are used, useful, and should be allowed in base cases if members desire to submit—but as OPTIONAL data

- A naming guideline should be documented to ensure orderly data

- WHERE—The big question is "where does the SRS want to document this?"—optional in the DPM or Business Practice?

- WHAT—What does the naming format look like?

- WHEN—When can members start using this format?

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DPM Change Request

Proposed Edits

The following modifications to the presenting approved DPM (or Business Practice Manual) are proposed to implement the change being requested. Existing language is identified in blue and change language in red:

Supplemental Data

Data for injection groups is not required to be provided for WECC base cases (except for when used in RAS models) but sharing this information may have benefits for member coordination in harmonizing contingency definitions, display files, and other study tools. For members who would like to provide injection groups as part of WECC base cases, the injection group name string should identify the data owner by naming the group models with the member system abbreviation and an underscore at the front. If a secondary owner identifier is desired, a forward slash character '/' may be used.

Naming examples include:

- CHPD_Rocky Reach
- PACE_Gadsby
- BPA/USBR_Grand Coulee
- PSE/IPP_Skookumchuck Wind

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