Application of Dual System Estimation Principles to National Renewable Energy Laboratory Frames Information and EIA Electricity Renewable Frames.

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At the Spring, 2004 meeting, the ASA-Energy Committee requested an example using dual system estimation principles, as applied to the National Renewable Energy Laboratory (NREL) frames and the EIA electricity frames (renewables) to estimate the number of facilities missing from both frames. Toward that end, I conducted the following analysis.

It should be remembered that in order to properly apply this methodology, there are two necessary assumptions that probably do not apply here:

- The frames need to be independently assembled. Since NREL largely uses secondary sources for their frame and their data, they probably use EIA for some of their frame information. Due to staff turnover problems at NREL, they were unable to estimate their reliance on EIA data and frame information.
- The missing frame information should be random rather than systematic. This appears not to be the case. For example, 140 out of 214 of the missing elements (65%) in the EIA frame are "Timber Residues."

However, as an exercise I applied the principles and arrived at the following.[1]

NREL Frame # of Elements:	5,146
EIA Frame # of Elements:	4,960
Elements Common to Both:	4,932
Elements in EIA frame not in NREL:	28
Elements in NREL not in EIA frame:	214
Estimate of number not in either frame:	X

In tabular form, the data would appear as follows:

Frame Elements	In NREL	Not in NREL
In EIA Frame	4,932	28
Not in EIA Frame	214	X

Using the error rates in the assembly of both frames, we can solve for X,

[1] Only renewable facilities (including hydro) above 1 MW nameplate capacity in both cases are being analyzed, although NREL collects information on all frames without the 1 MW cutoff.

X = Pr(NREL error) * Pr(EIA error) * Total number of known elements
X = 28/5146 * 214/4960 * 5146 = 1.2 missing elements (round to 1 since facilities are discrete)

We can apply the principle to all of the renewable fuels individually. The only fuel where we obtain a value other than 0 for X is for agricultural residues.

Frame	In NREL	Not in NREL
In EIA Frame	19	14
Not in EIA Frame	8	X

X = Pr(NREL error) * Pr(EIA error) * Total number of known elements
X = 14/27 * 8/33 * 33 = 4.1 missing elements (round to 4)