The MATPOWER case format also allows for additional fields to be included in the structure. The OPF is designed to recognize fields named `A`, `l`, `u`, `H`, `Cw`, `N`, `fparm`, `z0`, `zl` and `zu` as parameters used to directly extend the OPF formulation as described in Section 7.1. Additional standard optional fields include `bus_name`, `gentype` and `genfuel`.[61] Other user-defined fields may also be included, such as the `reserves` field used in the example code throughout Section 7.3. The `loadcase` function will automatically load any extra fields from a case file and, if the appropriate `'savecase'` callback function (see Section 7.3.5) is added via `add_userfcn`, `savecase` will also save them back to a case file.

Table B-1: Bus Data (`mpc.bus`)

name	column	description
BUS_I	1	bus number (positive integer)
BUS_TYPE	2	bus type (1 = PQ, 2 = PV, 3 = ref, 4 = isolated)
PD	3	real power demand (MW)
QD	4	reactive power demand (MVAr)
GS	5	shunt conductance (MW demanded at $V = 1.0$ p.u.)
BS	6	shunt susceptance (MVAr injected at $V = 1.0$ p.u.)
BUS_AREA	7	area number (positive integer)
VM	8	voltage magnitude (p.u.)
VA	9	voltage angle (degrees)
BASE_KV	10	base voltage (kV)
ZONE	11	loss zone (positive integer)
VMAX	12	maximum voltage magnitude (p.u.)
VMIN	13	minimum voltage magnitude (p.u.)
LAM_P†	14	Lagrange multiplier on real power mismatch (u/MW)
LAM_Q†	15	Lagrange multiplier on reactive power mismatch (u/MVAr)
MU_VMAX†	16	Kuhn-Tucker multiplier on upper voltage limit (u/p.u.)
MU_VMIN†	17	Kuhn-Tucker multiplier on lower voltage limit (u/p.u.)

† Included in OPF output, typically not included (or ignored) in input matrix. Here we assume the objective function has units u.

[61] All three of these are cell arrays of strings. See `gentypes` and `genfuels` for more information on the corresponding fields.

Table B-2: Generator Data (`mpc.gen`)

name	column	description
GEN_BUS	1	bus number
PG	2	real power output (MW)
QG	3	reactive power output (MVAr)
QMAX	4	maximum reactive power output (MVAr)
QMIN	5	minimum reactive power output (MVAr)
VG‡	6	voltage magnitude setpoint (p.u.)
MBASE	7	total MVA base of machine, defaults to baseMVA
GEN_STATUS	8	machine status, > 0 = machine in-service ≤ 0 = machine out-of-service
PMAX	9	maximum real power output (MW)
PMIN	10	minimum real power output (MW)
PC1*	11	lower real power output of PQ capability curve (MW)
PC2*	12	upper real power output of PQ capability curve (MW)
QC1MIN*	13	minimum reactive power output at PC1 (MVAr)
QC1MAX*	14	maximum reactive power output at PC1 (MVAr)
QC2MIN*	15	minimum reactive power output at PC2 (MVAr)
QC2MAX*	16	maximum reactive power output at PC2 (MVAr)
RAMP_AGC*	17	ramp rate for load following/AGC (MW/min)
RAMP_10*	18	ramp rate for 10 minute reserves (MW)
RAMP_30*	19	ramp rate for 30 minute reserves (MW)
RAMP_Q*	20	ramp rate for reactive power (2 sec timescale) (MVAr/min)
APF*	21	area participation factor
MU_PMAX†	22	Kuhn-Tucker multiplier on upper P_g limit (u/MW)
MU_PMIN†	23	Kuhn-Tucker multiplier on lower P_g limit (u/MW)
MU_QMAX†	24	Kuhn-Tucker multiplier on upper Q_g limit (u/MVAr)
MU_QMIN†	25	Kuhn-Tucker multiplier on lower Q_g limit (u/MVAr)

* Not included in version 1 case format.

† Included in OPF output, typically not included (or ignored) in input matrix. Here we assume the objective function has units u.

‡ Used to determine voltage setpoint for optimal power flow only if `opf.use_vg` option is non-zero (0 by default). Otherwise generator voltage range is determined by limits set for corresponding bus in `bus` matrix.

Table B-3: Branch Data (`mpc.branch`)

name	column	description
`F_BUS`	1	“from” bus number
`T_BUS`	2	“to” bus number
`BR_R`	3	resistance (p.u.)
`BR_X`	4	reactance (p.u.)
`BR_B`	5	total line charging susceptance (p.u.)
`RATE_A`*	6	MVA rating A (long term rating), set to 0 for unlimited
`RATE_B`*	7	MVA rating B (short term rating), set to 0 for unlimited
`RATE_C`*	8	MVA rating C (emergency rating), set to 0 for unlimited
`TAP`	9	transformer off nominal turns ratio, if non-zero (taps at “from” bus, impedance at “to” bus, i.e. if $r = x = b = 0$, $tap = \frac{\lvert V_f \rvert}{\lvert V_t \rvert}$; $tap = 0$ used to indicate transmission line rather than transformer, i.e. mathematically equivalent to transformer with $tap = 1$)
`SHIFT`	10	transformer phase shift angle (degrees), positive $\Rightarrow$ delay
`BR_STATUS`	11	initial branch status, 1 = in-service, 0 = out-of-service
`ANGMIN`†	12	minimum angle difference, $\theta_f - \theta_t$ (degrees)
`ANGMAX`†	13	maximum angle difference, $\theta_f - \theta_t$ (degrees)
`PF`‡	14	real power injected at “from” bus end (MW)
`QF`‡	15	reactive power injected at “from” bus end (MVAr)
`PT`‡	16	real power injected at “to” bus end (MW)
`QT`‡	17	reactive power injected at “to” bus end (MVAr)
`MU_SF`§	18	Kuhn-Tucker multiplier on MVA limit at “from” bus (u/MVA)
`MU_ST`§	19	Kuhn-Tucker multiplier on MVA limit at “to” bus (u/MVA)
`MU_ANGMIN`§	20	Kuhn-Tucker multiplier lower angle difference limit (u/degree)
`MU_ANGMAX`§	21	Kuhn-Tucker multiplier upper angle difference limit (u/degree)

* Used to specify branch flow limits. By default these are limits on apparent power with units in MVA. However, the `'opf.flow_lim'` option can be used to specify that the limits are active power or current, in which case the ratings are specified in MW or (kA$\cdot V_{\text{basekV}}$), respectively. For current this is equivalent to an MVA value at a 1 p.u. voltage.

† Not included in version 1 case format. The voltage angle difference is taken to be unbounded below if `ANGMIN` ≤ -360 and unbounded above if `ANGMAX` ≥ 360. If both parameters are zero, the voltage angle difference is unconstrained.

‡ Included in power flow and OPF output, ignored on input.

§ Included in OPF output, typically not included (or ignored) in input matrix. Here we assume the objective function has units u.

Table B-4: Generator Cost Data† (`mpc.gencost`)

name	column	description
`MODEL`	1	cost model, 1 = piecewise linear, 2 = polynomial
`STARTUP`	2	startup cost in US dollars*
`SHUTDOWN`	3	shutdown cost in US dollars*
`NCOST`	4	number $N = n + 1$ of data points defining an n-segment piecewise linear cost function, or of coefficients defining an n-th order polynomial cost function
`COST`	5	parameters defining total cost function $f(p)$ begin in this column, units of f and p are \$/hr and MW (or MVAr), respectively (`MODEL` = 1) $\Rightarrow\quad p_1, f_1, p_2, f_2, \ldots, p_N, f_N$ where $p_1 < p_2 < \cdots < p_N$ and the cost $f(p)$ is defined by the coordinates (p_1, f_1), (p_2, f_2), …, (p_N, f_N) of the end/break-points of the piecewise linear cost (`MODEL` = 2) $\Rightarrow\quad c_n, \ldots, c_1, c_0$ N coefficients of n-th order polynomial cost function, starting with highest order, where cost is $f(p) = c_n p^n + \cdots + c_1 p + c_0$

† If `gen` has n_g rows, then the first n_g rows of `gencost` contain the costs for active power produced by the corresponding generators. If `gencost` has $2n_g$ rows, then rows $n_g + 1$ through $2n_g$ contain the reactive power costs in the same format.

* Not currently used by any MATPOWER functions.

Table B-5: DC Line Data* (mpc.dcline)

name	column	description
F_BUS	1	"from" bus number
T_BUS	2	"to" bus number
BR_STATUS	3	initial branch status, 1 = in-service, 0 = out-of-service
PF†	4	real power flow at "from" bus end (MW), "from" → "to"
PT†	5	real power flow at "to" bus end (MW), "from" → "to"
QF†	6	reactive power injected into "from" bus (MVAr)
QT†	7	reactive power injected into "to" bus (MVAr)
VF	8	voltage magnitude setpoint at "from" bus (p.u.)
VT	9	voltage magnitude setpoint at "to" bus (p.u.)
PMIN	10	if positive (negative), lower limit on PF (PT)
PMAX	11	if positive (negative), upper limit on PF (PT)
QMINF	12	lower limit on reactive power injection into "from" bus (MVAr)
QMAXF	13	upper limit on reactive power injection into "from" bus (MVAr)
QMINT	14	lower limit on reactive power injection into "to" bus (MVAr)
QMAXT	15	upper limit on reactive power injection into "to" bus (MVAr)
LOSS0	16	coefficient l_0 of constant term of linear loss function (MW)
LOSS1	17	coefficient l_1 of linear term of linear loss function (MW/MW)
		($p_{\text{loss}} = l_0 + l_1 p_f$, where p_f is the flow at the "from" end)
MU_PMIN‡	18	Kuhn-Tucker multiplier on lower flow limit at "from" bus (u/MW)
MU_PMAX‡	19	Kuhn-Tucker multiplier on upper flow limit at "from" bus (u/MW)
MU_QMINF‡	20	Kuhn-Tucker multiplier on lower VAr limit at "from" bus (u/MVAr)
MU_QMAXF‡	21	Kuhn-Tucker multiplier on upper VAr limit at "from" bus (u/MVAr)
MU_QMINT‡	22	Kuhn-Tucker multiplier on lower VAr limit at "to" bus (u/MVAr)
MU_QMAXT‡	23	Kuhn-Tucker multiplier on upper VAr limit at "to" bus (u/MVAr)

* Requires explicit use of toggle_dcline.
† Output column, value updated by power flow or OPF (except PF in case of simple power flow).
‡ Included in OPF output, typically not included (or ignored) in input matrix. Here we assume the objective function has units u.