Reduced Potential Energy Matrix and Perturbed Reduced Potential Energy Matrix

state index	energy function	configurations from state *1*			configurations from state *2*				configurations from state *M*		
		x_1^1	...	$x_1^{N_1}$	x_2^1	...	$x_2^{N_2}$		x_M^1	...	$x_M^{N_M}$

sampled states

$$
\begin{array}{cc}
1 & U_1(\cdot) \\
\vdots & \vdots \\
M & U_M(\cdot)
\end{array}
\left[
\begin{array}{ccc}
U_1(x_1^1) & \cdots & U_1(x_1^{N_1}) \\
\vdots & \ddots & \vdots \\
U_M(x_1^1) & \cdots & U_M(x_1^{N_1})
\end{array}
\;\;
\begin{array}{ccc}
U_1(x_2^1) & \cdots & U_1(x_2^{N_2}) \\
\vdots & \ddots & \vdots \\
U_M(x_2^1) & \cdots & U_M(x_2^{N_2})
\end{array}
\;\cdots\;
\begin{array}{ccc}
U_1(x_M^1) & \cdots & U_1(x_M^{N_M}) \\
\vdots & \ddots & \vdots \\
U_M(x_M^1) & \cdots & U_M(x_M^{N_M})
\end{array}
\right] = A_{M,N}
$$

perturbed states

$$
\begin{array}{cc}
1 & U'_1(\cdot) \\
\vdots & \vdots \\
L & U'_L(\cdot)
\end{array}
\left[
\begin{array}{ccc}
U'_1(x_1^1) & \cdots & U'_1(x_1^{N_1}) \\
\vdots & \ddots & \vdots \\
U'_L(x_1^1) & \cdots & U'_L(x_1^{N_1})
\end{array}
\;\;
\begin{array}{ccc}
U'_1(x_2^1) & \cdots & U'_1(x_2^{n_2}) \\
\vdots & \ddots & \vdots \\
U'_L(x_2^1) & \cdots & U'_L(x_2^{N_2})
\end{array}
\;\cdots\;
\begin{array}{ccc}
U'_1(x_M^1) & \cdots & U'_1(x_M^{n_M}) \\
\vdots & \ddots & \vdots \\
U'_L(x_M^1) & \cdots & U'_L(x_M^{N_M})
\end{array}
\right] = B_{L,N}
$$