

ภาคผนวก ค**โปรแกรมการคำนวณแบบจำลองการประหยัดพลังงาน**

แบบจำลองการประหยัดพลังงานจะถูกคำนวณโดยใช้โปรแกรม Microsoft Excel
ซึ่งจะมีรายละเอียดดังต่อไปนี้

2 Dimensional model

GDP of industry in the based year=B2

GDP of industry in the year t=B3

Energy consumption in the based year=C2

Energy consumption in the year t=C3

$$D2=C2/B2$$

GDPeffect=E2=(D2*(B3-B2)+(D3-D2)*(B3-B2)/2)

Ieffect=F2=(B2*(D3-D2)+(D3-D2)*(B3-B2)/2)

Real change=G2=E2+F2

Energy saving=H2=-F2

Real in the base year=K2=C2

Real in the year t=K3=C2+G2

Trend in the based year=L2=C2

Trend in the year t=L3=C2+E2

3 Dimensional model

Energy consumption in the based year=B2

Energy consumption in the year t=B3

GDP of sector in the based year=C2

GDP of sector in the year t=C3

GDP of industry in the based year=D2

GDP of industry in the year t=D3

$$E2=B2/C2$$

$$F2=C2/D2$$

$$G2=E3-E2$$

$$H2=F3-F2$$

$$I2=D3-D2$$

$$I_{effect}=J3=D2 * F2 * G2 + G2 * (F2 * I2 + D2 * H2) / 2 + I2 * G2 * H2 / 3$$

$$S_{effect}=K3=D2 * E2 * H2 + H2 * (E2 * I2 + D2 * G2) / 2 + I2 * G2 * H2 / 3$$

$$GDP_{effect}=L3=I2 * E2 * F2 + I2 * (E2 * H2 + F2 * G2) / 2 + I2 * G2 * H2 / 3$$

$$Real\ change=M3=J3+K3+L3$$

$$Energy\ saving=N3=-(J3+K3)$$

$$Real\ 2530=P2=B2$$

$$Real\ 2531=P3=B2+M3$$

$$Trend\ 2530=Q2=B2$$

$$Trend\ 2531=Q3=B2+L3$$

2 Dimensional sensitivity analyses

Energy consumption in the year t=A2

Energy consumption in the based year=C2

GDP of industry in the year t=B2

GDP of industry in the based year=D2

$$A2=100/100 * A2$$

$$B2=100/100 * B2$$

$$E2=A3-A2$$

$$F2=B3-B2$$

Influence of $E^t=H2=-(D2/(2*B2)+1/2)*E2$

Influence of $GDP^t=I2=-(-D2*A2/(2*B2^2)-C2/(2*D2))*F2$

Total change of energy saving ($d\Psi$)= $J2=H2+I2$

3 Dimensional sensitivity analyses (mining sector)

Energy consumption in mining sector in the based year = $B2$

Energy consumption in mining sector in the year t = $B12$

GDP of industry in the based year= $D2$

GDP of mining sector in the based year= $C2$

GDP of mining sector in the year t= $C8$

GDP of construction sector in the year t= $C9$

GDP of manufacturing sector in the year t= $C10$

Based value of I_{effect} = $J5$

Based value of S_{effect} = $K5$

Based value of energy saving= $O3$

$$B2=100/100*B12$$

$$C3=100/100*C4$$

$$C4=100/100*C8$$

$$C5=100/100*C9$$

$$C6=100/100*C10$$

$$C13=C4-C8$$

$$C14=C5-C9$$

$$C15=C6-C10$$

$$C16=B3-B12$$

$$C17=J3-J5$$

$$C18=K3-K5$$

$$D3=C4+C5+C6$$

$$E2=B2/C2*1000$$

$$E3=B3/C3*1000$$

Influence of $E_1' = E5$

$$E5=-((D2/(3*(C8+C9+C10))-C2*(C8+C9+C10)/(6*C8*D2)+C2/(6*C8)+2/3))*C16$$

Influence of $Q_1' = E6$

$$E6=-(-B12*D2/(3*(C8+C9+C10)*(C8+C9+C10))+B12*C2*(C9+C10)/(6*D2*C8*C8)-B2/(3*D2)-B12*C2/(6*C8*C8)-B2/(6*C2)+B2*D2*(C9+C10)/(6*C2*(C8+C9+C10)*(C8+C9+C10)))*C13$$

Influence of $Q_2' = E7$

$$E7=-(-B12*D2/(3*(C8+C9+C10)*(C8+C9+C10))-B12*C2/(6*C8*D2)-B2/(3*D2)-B2*C8*D2/(6*C2*(C8+C9+C10)*(C8+C9+C10)))*C14$$

Influence of $Q_3' = E8$

$$E8=-(-B12*D2/(3*(C8+C9+C10)*(C8+C9+C10))-B12*C2/(6*C8*D2)-B2/(3*D2)-B2*C8*D2/(6*C2*(C8+C9+C10)*(C8+C9+C10)))*C15$$

Total estimation= $E9=SUM(E5:E8)$

Real value= $E10=N3-O3$

Influence of E_1' in $dS_{effect} = E14$

$$E14=-((D2/(6*(C8+C9+C10))+1/3-C2/(6*C8)-C2*(C8+C9+C10)/(3*D2*C8))*C16)$$

Influence of Q_1' in $dS_{effect} = E15$

$$E15=-((D2*B2*(C9+C10)/(3*C2*(C8+C9+C10)*(C8+C9+C10))-D2*B12/(6*(C8+C9+C10)*(C8+C9+C10))+B2/(6*C2)+C2*B12/(6*C8*C8)-B2/(6*D2)+C2*B12*(C9+C10)/(3*D2*C8*C8))*C13)$$

Influence of Q_2' in $dS_{effect} = E16$

$$E16 = -\left(\frac{-C8 \cdot D2 \cdot B2}{3 \cdot C2 \cdot (C8 + C9 + C10)} \cdot (C8 + C9 + C10) \right) - \\ D2 \cdot B12 / (6 \cdot (C8 + C9 + C10) \cdot (C8 + C9 + C10)) - B2 / (6 \cdot D2) - \\ C2 \cdot B12 / (3 \cdot D2 \cdot C8) \cdot C14$$

Influence of Q_3^i in $dS_{effect} = E17$

$$E17 = -\left(\frac{-C8 \cdot D2 \cdot B2}{3 \cdot C2 \cdot (C8 + C9 + C10)} \cdot (C8 + C9 + C10) \right) - \\ D2 \cdot B12 / (6 \cdot (C8 + C9 + C10) \cdot (C8 + C9 + C10)) - B2 / (6 \cdot D2) - \\ C2 \cdot B12 / (3 \cdot D2 \cdot C8) \cdot C15$$

Total estimation in $S_{effect} = E18 = \text{SUM}(E14:E17)$

Real value in $S_{effect} = C18$

$$F2 = C2 / D2$$

$$F3 = C3 / D3$$

Influence of E_1^i in $dI_{effect} = F5$

$$F5 = - \\ \left(\frac{C2}{3 \cdot C8} + D2 / (6 \cdot (C8 + C9 + C10)) + C2 \cdot (C8 + C9 + C10) / (6 \cdot D2 \cdot C8) + 1/3 \right) \cdot C16 \\)$$

Influence of Q_1^i in $dI_{effect} = F6$

$$F6 = -\left(\frac{-C2 \cdot B12}{3 \cdot C8 \cdot C8} - D2 \cdot B12 / (6 \cdot (C8 + C9 + C10) \cdot (C8 + C9 + C10)) - \\ D2 \cdot B2 \cdot (C9 + C10) / (6 \cdot C2 \cdot (C8 + C9 + C10) \cdot (C8 + C9 + C10)) - \\ C2 \cdot B12 \cdot (C9 + C10) / (6 \cdot D2 \cdot C8 \cdot C8) - B2 / (6 \cdot D2) - B2 / (3 \cdot C2) \right) \cdot C13$$

Influence of Q_2^i in $dI_{effect} = F7$

$$F7 = -\left(\left(\frac{D2 \cdot B12}{6 \cdot (C8 + C9 + C10) \cdot (C8 + C9 + C10)} + D2 \cdot C8 \cdot B2 / (6 \cdot C2 \cdot (C8 + C9 + C10) \cdot (C8 + C9 + C10)) + C2 \cdot B12 / (6 \cdot D2 \cdot C8) - B2 / (6 \cdot D2) \right) \cdot C14 \right)$$

Influence of Q_3^i in $dI_{effect} = F8$

$$F8 = -\left(\left(\frac{D2 \cdot B12}{6 \cdot (C8 + C9 + C10) \cdot (C8 + C9 + C10)} + D2 \cdot C8 \cdot B2 / (6 \cdot C2 \cdot (C8 + C9 + C10) \cdot (C8 + C9 + C10)) + C2 \cdot B12 / (6 \cdot D2 \cdot C8) - B2 / (6 \cdot D2) \right) \cdot C15 \right)$$

Total estimation in $I_{effect} = F9 = \text{SUM}(F5:F8)$

Real value in $S_{effect} = F10 = C17$

$$G2 = E3 - E2$$

$$H2 = F3 - F2$$

$$I2 = D3 - D2$$

$$J3 = (G2 * F2 * D2 + G2 * (H2 * D2 + F2 * I2) / 2 + G2 * H2 * I2 / 3) / 1000 * 100 / 100$$

$$K3 = (E2 * H2 * D2 + H2 * (G2 * D2 + E2 * I2) / 2 + G2 * H2 * I2 / 3) / 1000 * 100 / 100$$

$$L3 = (E2 * F2 * I2 + I2 * (G2 * F2 + E2 * H2) / 2 + G2 * H2 * I2 / 3) / 1000$$

$$M3 = \text{SUM}(J3:L3)$$

$$N3 = -\text{SUM}(J3:K3)$$